

2020 Census Detailed Operational Plan for: 8. Address Canvassing Operation

A New Design for the 21st Century

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Table of Contents

1	Document Purpose.....	1
2	Operational Overview	2
2.1	Operation Purpose	2
2.2	Background	2
2.2.1	Address Canvassing Reengineered for 2020 Census.....	2
2.2.2	The MAF/TIGER System.....	3
2.2.3	Decennial Census Address Frame Operations.....	4
2.3	Design Overview	5
2.3.1	High Level Operational Design	5
2.3.2	ADC Operational Context	8
2.4	ADC Data Flow and Operational Influences	23
2.5	Address Canvassing Design Assumptions	30
2.5.1	Block Universe	30
2.5.2	Address Universe.....	31
2.5.3	Address Canvassing Workload Estimates	32
2.6	Additional Background on 2020 Census Address List Development.....	33
2.6.1	The Early Years (2010-2014)	34
2.6.2	Middecade and Beyond (2015-2020)	37
3	In-Office Address Canvassing [ADC 8-1]	44
3.1	Design Overview	44
3.2	Detailed Process Description	45
3.2.1	Conduct In-Office Address Canvassing Work [ADC 8-1.1].....	47
3.2.2	Produce Field Workload Requests [ADC 8-1.2]	85
4	MAF Coverage Study [ADC 8-2]	88
4.1	Design Overview	88
4.2	Detailed Process Description	89
4.2.1	MAFCS Data Inputs and Sample Selection [ADC 8-2.1]	92
4.2.2	MAFCS Field Staffing Needs [ADC 8-2.2]	94

4.2.3	MAFCS Field Data Collection Work (including QC) [ADC 8-2.3].....	97
4.2.4	MAFCS Final Outputs [ADC 8-2.4].....	107
4.2.5	MAFCS Estimation and Analysis [ADC 8-2.5]	108
5	In-Field Address Canvassing [ADC 8-3]	110
5.1	Design Overview	110
5.2	Detailed Process Description	111
5.2.1	In-Field Address Canvassing Data Inputs [ADC 8-3.1]	113
5.2.2	In-Field Address Canvassing Staffing Needs [ADC 8-3.2].....	113
5.2.3	In-Field Address Canvassing Fieldwork (including QC) [ADC 8-3.3].....	115
5.2.4	In-Field Address Canvassing Final Outputs [ADC 8-3.4].....	120
6	Cost Factors.....	122
6.1	Background	122
6.2	Cost Factors.....	122
6.3	Relevant IDEF0 Mechanisms.....	123
7	Measures of Success.....	125
Appendix A – Acronyms and Terminology		126
Appendix B – References.....		135
Appendix C – Activity Tree for Address Canvassing (ADC) Operation		136
Appendix D – In-Field Address Canvassing Status Codes		138
Appendix E – 2020 Census Group Quarters Type Codes.....		139

List of Figures

Figure 1: Address Canvassing Operation (ADC) Context Diagram.....	9
Figure 2: 2020 Census Frame Development Integrated Operations Diagram	25
Figure 3: GSS Address File Acquisition Status, by Data Provider.....	38
Figure 4: Match Ratio of 2010 Census and Administrative Records Addresses	40
Figure 5: In-Office Address Canvassing [ADC 8-1] within Top-Level ADC Context Model	46
Figure 6: Conduct In-Office Address Canvassing Work [ADC 8-1.1] Constituent Activities	48
Figure 7: Conduct In-Office Address Canvassing Work Detailed View	50
Figure 8: Interactive Review (IR)	53

Figure 9: Active Block Resolution (ABR).....	61
Figure 10: Change Monitoring (Triggers)	70
Figure 11: In-Field Canvassing Decision	72
Figure 12: Ungeocoded Resolution (UR)	74
Figure 13: Conduct In-Office Address Canvassing Group Quarters/Transitory Locations	79
Figure 14: LUCA Address Validation	83
Figure 15: Produce Field Workload Requests [ADC 8-1.2] Constituent Activities.....	86
Figure 16: MAF Coverage Study [ADC 8-2] within Top-Level ADC Context Model.....	90
Figure 17: MAFCS Constituent Activities	91
Figure 18: MAFCS Field Staffing Needs	95
Figure 19: MAFCS Field Data Collection Work (including QC).....	99
Figure 20: In-Field Address Canvassing [ADC 8-3] within Top-Level ADC Context Model ..	112
Figure 21: In-Field Address Canvassing Fieldwork (including QC) Constituent Activities.....	116
Figure 22: Performing the In-Field Address Canvassing Work	118

List of Tables

Table 1: ADC Operational Inputs	11
Table 2: ADC Operational Controls	13
Table 3: ADC Operational Outputs	14
Table 4: Staff Resources used within ADC Operational Activities.....	16
Table 5: Infrastructure Sites for ADC Operational Activities	17
Table 6: Systems used within ADC Operational Activities.....	18
Table 7: Results of the Address Source Evaluation for Partner Provided Files	39
Table 8: Imagery Review Outcomes.....	59
Table 9: Acronyms and Abbreviations List	126
Table 10: Glossary of Terms.....	131
Table 11: In-Field Address Canvassing Status Codes	138
Table 12: 2020 Census Group Quarters Type Codes.....	139

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1 Document Purpose

The 2020 Census Detailed Operational Plan for the Address Canvassing operation (ADC) is intended for use by U.S. Census Bureau managers, staff, contractors, and other internal and external stakeholders working on the 2020 Census. The document presents the detailed operational design for the 2020 Census ADC operation and includes a summary of the operational processes involved, their inputs, outputs, controls, and the basic mechanisms employed to conduct the operational work.

Anticipated uses of this document include the following:

- Communication—Documents operational design details for internal and external stakeholders.
- Planning—Documents planning assumptions and key milestones.
- Staffing—Documents staffing needs and strategies.
- Design—Describes operations and flows, which inform design of IT systems, manual processes, and training.
- Development—Identifies business rules and required capabilities to be developed.
- Testing—Provides a basis for developing integrated test plans for IT systems and processes.

This document complements the 2020 Census Operational Plan, which presents the 2020 Census operational design and covers all operations required to execute the 2020 Census, starting with precensus address and geographic feature updates and ending once census data products are disseminated and coverage and quality are measured. This document includes the complete operational design for 2020 Address Canvassing, including activities that are planned, implemented, and in some cases, discontinued.

2 Operational Overview

2.1 Operation Purpose

The Address Canvassing (ADC) operation serves two purposes:

- Deliver a complete and accurate address list and spatial database for enumeration.
- Determine the type and address characteristics for each living quarter.

Specifically, this operation implements methods to improve and refine the United States Census Bureau's address list in advance of the 2020 Census enumeration. The Census Bureau needs the address and physical location of each living quarter in the United States and Puerto Rico to conduct and tabulate the census. An accurate list ensures that residents will be invited to participate in the census and that the census counts residents in the correct location. To support this effort, the Census Bureau has developed innovative methodologies for updating the Master Address File (MAF)/Topologically Integrated Geographic Encoding and Referencing (TIGER) System throughout the decade.

2.2 Background

2.2.1 Address Canvassing Reengineered for 2020 Census

The Address Canvassing operation assures a complete and accurate address list for the decennial census prior to enumeration. Historically, Address Canvassing field staff, referred to as listers, traversed almost every block in the United States and Puerto Rico, comparing their observations on the ground with the Census Bureau's address list. Listers verified or corrected addresses that were on the list, added new addresses to the list, and deleted addresses that no longer existed. Listers also collected map spot (coordinate) locations for each structure and added new streets.

The Census Bureau considered this method the best way to establish a complete address list, but it was very expensive. During the full In-Field Address Canvassing operation for the 2010 Census, 8,213 crew leaders managed 111,105 listers during production listing and 3,083 crew leaders managed 37,784 listers during quality control listing for a cost of \$443,591,299 (Address List Operations Implementation Team, 2012). Additional costs were incurred for field infrastructure and information technology infrastructure support.

Research also shows that this method is not always the most effective way to update the address frame. Advancements in technology have enabled continual address and spatial updates to occur throughout the decade as part of an In-Office Address Canvassing effort. The availability of up-to-date high quality, high-resolution aerial and street-level imagery provides a viable tool to reduce fieldwork in many parts of the United States. Efficient and effective in-office review of

multiple sources of address information can substitute for fieldwork, especially in areas that have been residentially stable.

The Census Bureau has determined that while there will be a full address canvassing of the nation for the 2020 Census, a full In-Field Address Canvassing is no longer necessary. In-Field Address Canvassing will only be needed in some areas of the country, and these areas will be determined by In-Office Address Canvassing.

To improve operational efficiencies, the Census Bureau has reengineered address canvassing for the 2020 Census to include a more efficient suite of In-Office and In-Field Address Canvassing operations that will update the address list and map data for the 2020 Census enumeration. This document describes this updated Address Canvassing methodology.

2.2.2 The MAF/TIGER System

The MAF/TIGER System, which includes software applications and databases, serves as the national repository for all of the spatial, geographic, and residential address data needed for census and survey data collection, data tabulation, data dissemination, geocoding services, and map production. The MAF/TIGER System supports the Census Bureau's census and survey programs. The MAF contains all known living quarters and serves as the base of the census frame. The Census Bureau uses the MAF to deliver questionnaires and postcards, and to facilitate in-person data collection. Each address in the MAF is designed to be linked to a geographic location in TIGER, the Census Bureau's spatial feature database. This linkage ensures that the census data are processed and tabulated in the correct geographic location.

The Census Bureau established the first MAF/TIGER System to support Census 2000 enumeration. Before 1970, the census was conducted in an all-in-one operation in which enumerators were responsible for listing addresses and conducting interviews at the same time. Beginning in 1970, each decennial census has used some form of canvassing to validate and update the Census Bureau address list before mailing census questionnaires. For the 1970, 1980, and 1990 censuses, the Census Bureau began with a commercially purchased address list for available metropolitan areas and then conducted canvassing operations to improve the list. For Census 2000, the goal was to build and maintain a permanent housing unit address list for future use. The 1990 Address Control File was the initial base for the MAF. The United States Postal Service (USPS) Delivery Sequence File (DSF) provided regular updates to the MAF in city-style address areas. Census 2000 frame operations, including the Local Update of Census Addresses (LUCA), Block Canvassing, and Address Listing, were the first decennial census operations to update the MAF. Census 2000 enumeration operations supplied additional updates to the MAF.

After Census 2000, the advent of the American Community Survey (ACS)— an ongoing census survey to collect community information— strengthened the need for MAF/TIGER System updates throughout the decade. Between 2000 and 2010, the Census Bureau continued to use the USPS's DSF to update the MAF at least twice each year. Additionally, the ACS established the

Community Address Updating System (CAUS). CAUS is a program that provides field-verified address updates to the MAF, particularly in areas where the DSF was considered deficient. These updates continued through 2009, when the decennial census conducted a large-scale In-Field Address Canvassing operation to update the MAF/TIGER System.

After the 2010 Census, the USPS's DSF and CAUS data continued to update the MAF/TIGER System, along with other special census and current survey programs. However, the Census Bureau determined that there was a need for a more concerted, larger-scale effort to update and validate the MAF/TIGER System to support census surveys and the 2020 Census. This prompted the development of the Geographic Support System (GSS) Initiative, a continuous plan to provide current, accurate, and complete address, feature, and boundary data. The GSS programs and the Address Canvassing operation will work together to update the MAF/TIGER System and establish the 2020 Census address list. This document describes these programs in more detail.

2.2.3 Decennial Census Address Frame Operations

The MAF/TIGER System provides the base for the decennial census address list and map data. DSF updates to the MAF continue throughout the census life cycle. The Census Bureau also conducts several operations to validate and update the census address list as part of the decennial census effort. Some of these operations focus solely on updating the address list prior to enumeration. Other operations are conducted at the time of enumeration with the intent to update the address list and enumerate households.

For the 2010 Census, the Census Bureau conducted the Group Quarters Validation (GQV) operation after the Address Canvassing operation and prior to enumeration. The purpose of the GQV operation was to improve the group quarters (GQ) frame¹. Field staff visited a specific address to determine if it was GQ, housing unit, transitory location², nonresidential, or nonexistent. If the address was a GQ, the lister conducted an in-person interview with the GQ contact person to determine the type of GQ and collect additional information to plan for enumeration. In support of a more efficient census design strategy, the 2020 Census will not conduct a separate operation to validate GQ information. Instead, the 2020 Census will validate

¹ Group quarters are places where people live or stay, in a group living arrangement, which is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories.

² Transitory locations are recreational vehicle parks, campgrounds, hotels, motels, marinas, racetracks, circuses, and carnivals.

as much GQ and transitory location (TL) information as possible during the Address Canvassing operation.

Once the initial address list operations are complete, the census conducts enumeration operations. For the 2010 Census, field staff concurrently conducted enumeration activities and updated the address list using In-Field Address Canvassing methods during two enumeration operations. In general, the operations were conducted in areas where Census Bureau expected problems with getting the mail to the actual physical location of the address. In the 2010 Census and Census 2000 Update/Leave operations, the field worker updated the address list and left a census questionnaire at the door for the resident of the household to complete and mail back to the Census Bureau. In the 2010 Census Update/Enumerate operation, the field worker updated the address list and conducted an in-person interview to enumerate members of the household.

For the 2010 Census, Address Canvassing was also conducted in Update/Leave areas and Update/Enumerate areas (with the exception of very remote areas of Maine and Alaska), meaning the Census Bureau visited areas twice in rapid succession to update the address list, despite little anticipated housing change. This strategy was deemed necessary to provide timely feedback to the 2010 Census LUCA participants. The feedback was required prior to the start of the census enumeration. The Update/Leave and Update/Enumerate operations were conducted too late to provide that LUCA feedback. For the 2020 Census, the Census Bureau will not conduct In-Field Address Canvassing in these types of areas and will rely on In-Office Address Canvassing results to provide feedback to LUCA participants.

2.3 Design Overview

The sections below present the high-level design for the 2020 Census Address Canvassing operation. Please refer to the 2020 Census Operational Plan for a complete inventory of design decisions for all 2020 Census operations.

2.3.1 High Level Operational Design

The design of the Address Canvassing operation for the 2020 Census includes three major operational activity areas, as discussed in Sections 3 through 5:

- **In-Office Address Canvassing**
 - Conducts an imagery review of all blocks.
 - Conducts research to resolve coverage problems.
 - Conducts research to resolve ungeocoded addresses.
 - Validates and updates address information for GQs and TLs.
 - Validates LUCA submissions.
 - Guides the In-Field Address Canvassing strategy.

- Updates the address list.
- **MAF Coverage Study**
 - Measures the address list coverage.
 - Assesses the In-Office Address Canvassing strategy.
 - Updates the address list.
- **In-Field Address Canvassing**
 - Conducts a field canvass of Basic Collection Units (BCUs) identified by the In-Office Address Canvassing activities (often generically referred to as “blocks” by field staff conducting the operation).
 - Updates the address list.

Each of these activities includes an integrated **Quality Control** activity that ensures quality data collection.

Each of these major activities is summarized below. Together, these activities represent the complete set of work that needs to be performed to conduct this operation.

In-Office Address Canvassing

In-Office Address Canvassing is the process of using empirical geographic evidence (e.g., imagery, and comparison of the Census Bureau’s address list to partner-provided lists) to assess the current address list. This process detects and identifies change using high quality imagery, administrative data, and third-party data sources to reduce the In-Field Address Canvassing workload. In-Office Address Canvassing includes five components: Interactive Review (IR); Active Block Resolution (ABR); Ungeocoded Resolution (UR); In-Office Address Canvassing Group Quarters/Transitory Locations; and LUCA Address Validation.

Interactive Review

During the IR process, staff compare a baseline satellite image from the time of the 2010 Census Address Canvassing operation to a current image to identify growth and decline of living quarters in the residential landscape, as well as overcoverage and undercoverage of living quarters in the census address frame. Staff also evaluate blocks for their capacity to add more living quarters (that is, whether a block is “built-out”). Each block receives one of three statuses:

- **Passive** – Blocks with no apparent overcoverage (more addresses on the Census Bureau address list than there are living quarters on the ground) and/or undercoverage (fewer

addresses on the Census Bureau address list than there are living quarters on the ground) are considered complete.

- Active – Blocks containing growth, decline, overcoverage and/or undercoverage are sent for In-Field Address Canvassing (or were sent to ABR when this activity was in progress).
- On Hold – Blocks with issues such as unclear imagery or where reviewers see evidence of ongoing construction (“future growth”) are placed On Hold pending acquisition of updated imagery or sufficient time for completion of construction.

Active Block Resolution

ABR seeks to research and update areas identified with growth, decline, undercoverage of address, or overcoverage of addresses in the MAF. The ABR staff use several data sources to update the MAF and to resolve IR Active blocks. The ABR program was in place beginning in April 2016 and was discontinued in February 2017 as a result of funding uncertainty and reprioritization of critical components of the 2020 Census. Since this program was performed leading up to the 2020 Census Address Canvassing operation as a part of the In-Office Address Canvassing activities that began in 2015, it is considered part of the 2020 Census Address Canvassing operational design.

Ungeocoded Resolution

UR is an activity designed to resolve ungeocoded records (addresses that are not assigned to a block) by adding or editing spatial features and address ranges in the MAF/TIGER System.

In-Office Address Canvassing Group Quarters/Transitory Locations

In-Office Address Canvassing Group Quarters/Transitory Locations is an activity designed to identify, validate, and update living quarters that are classified by the Census Bureau as a GQ or TL. Research is completed using administrative data, local Geographic Information System (GIS) data, public and commercial information, and in some cases phone calls that are made to administrative contacts.

LUCA Address Validation

LUCA Address Validation is an In-Office Address Canvassing activity that reviews LUCA submissions by outside partners. LUCA provides the opportunity for tribal, state, and local governments to review and comment on the Census Bureau’s address list to ensure an accurate and complete enumeration of their communities. LUCA Address Validation is designed to use office research to validate submissions provided by these entities.

MAF Coverage Study

The MAF Coverage Study (MAFCS) is a field activity that measures the coverage of the census address list, validates In-Office Address Canvassing processes, and updates the MAF on a

continuous basis. The MAFCS was conducted in Fiscal Year (FY) 2016 and during part of FY 2017. Based on funding uncertainty and reprioritization of critical components of the 2020 Census, the MAFCS was discontinued in April 2017.

In-Field Address Canvassing

In-Field Address Canvassing is the process of having field staff visit specific geographic areas to identify every place where people could live or stay. Field staff then compare what they see on the ground to the existing census address list and verify, correct, or add address and location information.

Quality Control

Quality Control (QC) is the process of reviewing the work of field and office staff. For the operational design for 2020 Census Address Canvassing, QC is an integrated part of each of the three components that make up the ADC operation. The QC program for Address Canvassing is responsible for devising a plan to ensure quality of the In-Office Address Canvassing, MAFCS, and In-Field Address Canvassing work. For the QC of In-Field Address Canvassing and MAFCS, this means ensuring proper execution of duties by field staff. For In-Office Address Canvassing, QC strategies include additional review and adjudication of work. It also includes a process for informing individual analysts of errors that is intended to reduce their future error rate. The success of the Address Canvassing operation relies on the success and integration of all three major activities and their respective quality control and quality assurance activities.

The full hierarchy of activities for the Address Canvassing operation is provided in Appendix C in the form of an Activity Tree. In the Activity Tree, each major operational activity area listed above is numbered and then decomposed into a numbered set of subactivities, some of which are further decomposed into more detailed numbered subactivities or steps.

For a full description of the operational subactivities that comprise the Address Canvassing operation, see the Detailed Process Description discussions in the subsequent chapters.

2.3.2 ADC Operational Context

The ADC operational activities described above are conducted within the context of other 2020 Census operations and other programs or data sources that are external to the 2020 Census Program. One way to depict an operational context is by using a “Context Diagram,” which shows the boundary of the operational process, the operational activities it contains, and the information exchanged with its neighbor operations (or other entities) as well as the resources (mechanisms) needed to conduct the operational work.

Figure 1 is a top-level context diagram for the ADC operation represented as an Integrated Definition, Level 0 (IDEF0) model. An IDEF0 model of a process (or operation) shows the Inputs, Controls, Outputs, and Mechanisms of the process. These IDEF0 model elements are summarized below.

The yellow box in the center of the IDEF0 model lists the major operational activity areas for the operation; numbers correspond to the ADC operation Activity Tree in Appendix C. Specific Information Exchanges (IE) are shown in different colored boxes to represent the Inputs (green boxes on the left side), Outputs (orange boxes on the right side), Controls (purple boxes on top), and Mechanisms (blue boxes on the bottom). Boxes to the left of the Inputs indicate the Provider of the inputs to the operation (typically another 2020 Census operation or an external source). The Provider of the Controls is noted in the box itself. Boxes to the right of the Outputs indicate the Receiver of the outputs (typically another 2020 Census operation or external entity). Each Information Exchange has a name and a unique number for identification purposes.

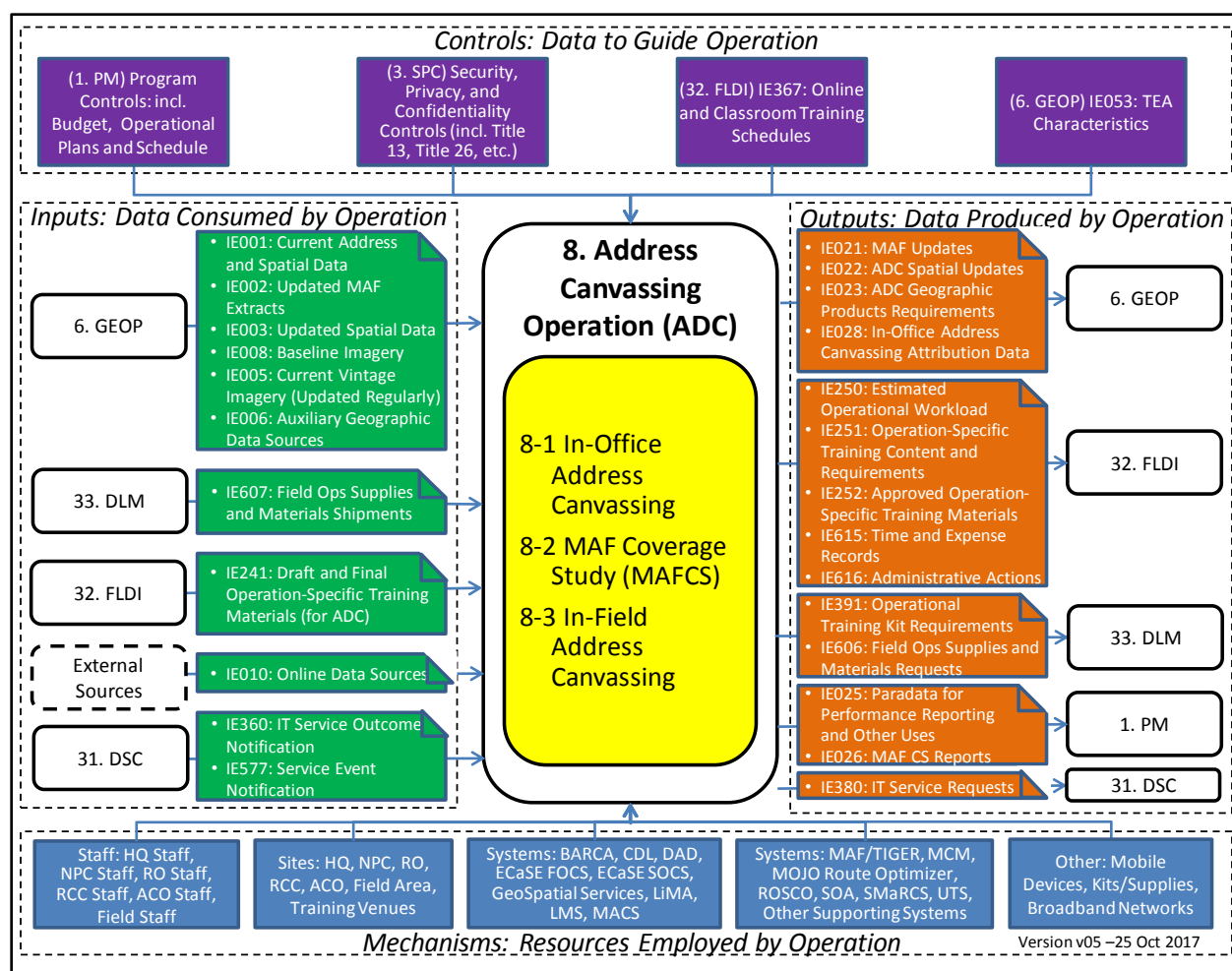


Figure 1: Address Canvassing Operation (ADC) Context Diagram

For Address Canvassing, the input data is dominated by the Address and Spatial Data and Imagery data provided by the Geographic Programs operation (GEOP). These inputs are

supplemented by online data from External Sources where needed. Auxiliary data sources from GEOP include the Delivery Sequence File (DSF) and local data sources.

The ADC operation is guided by program controls— legal requirements that ensure privacy, confidentiality, and security of response data— as well as business rules. The In-Field Address Canvassing need is determined based on Business Rules.

The output data from Address Canvassing is dominated by the updates to the MAF addresses and associated spatial data from the three major ADC operational activities. These updates help ensure a complete and accurate address list and spatial database for enumeration and tabulation. Additional outputs related to process improvement and reporting are also provided to the Program Management operation (PM). To support the field component, ADC sends operational training kit requirements to Decennial Logistics Management (DLM). Field Infrastructure (FLDI) is provided the estimated ADC Workload, as well as specific training content and requirements. FLDI then sends the training materials to ADC.

To meet the needs and requirements of the operation, ADC relies on Census Bureau staff, infrastructure sites, and most notably MAF/TIGER and associated utility systems. Other mechanisms employed include the mobile devices (laptops, tablets, smartphones) used by fieldworkers (listers and supervisors) as well as kits/supplies and broadband network mobile access for fieldwork.

For detailed descriptions of the Inputs, Controls, Outputs, and Mechanisms used by the Address Canvassing operation, see the sections that follow.

2.3.2.1 ADC Operational Inputs

Inputs are the data that are consumed by the operation. The inputs define the amount of operational work that needs to be performed.

Table 1 lists the inputs to the Address Canvassing operation.

Table 1: ADC Operational Inputs

Provider	Information Exchange	Description
6. Geographic Programs Operation (GEOP)	<ul style="list-style-type: none"> • IE001: Current Address and Spatial Data • IE002: Updated MAF Extracts • IE003: Updated Spatial Data 	<p>Address and Spatial data from MAF/TIGER.</p> <p>For Address Canvassing, MAF Extracts include:</p> <ul style="list-style-type: none"> • General MAF Extracts for all addresses in the MAF. • GQ Frame Extracts including both GQs and TLs. • Ungeocoded Records to be prioritized for UR. <p>For Address Canvassing, spatial data includes:</p> <ul style="list-style-type: none"> • Collection Geography. Delineations for BCUs, SLUs, TEAs. • FMA Delineations for CFMs, ACOs, RCCs.
6. Geographic Programs Operation (GEOP)	<ul style="list-style-type: none"> • IE008: Baseline Imagery • IE005: Current Vintage Imagery (Updated Regularly) 	<p>The Census Bureau will acquire imagery and provide it as a service to the In-Office Address Canvassing operation as well as other census operations. Two vintages of imagery will be acquired:</p> <ul style="list-style-type: none"> • A circa 2009 baseline vintage to serve as the base for comparison (comparable to the conditions for the address canvassing effort for the 2010 Census) • Current vintage (updated regularly)

Provider	Information Exchange	Description
6. Geographic Programs Operation (GEOP)	IE006: Auxiliary Geographic Data Sources	<p>Auxiliary Geographic Data sources including:</p> <ul style="list-style-type: none"> • Delivery Sequence File (DSF) • Parcel Data • Local Data Sources • Imagery • Natural disasters data
33. Decennial Logistics Management Operation (DLM)	IE607: Field Ops Supplies and Materials Shipments	Shipment of additional supplies and materials required to support the field operation. Provided in response to requests made by the field operations to DLM.
32. Field Infrastructure Operation (FLDI)	IE241: Draft and Final Operation-Specific Training Materials (for ADC)	All materials needed to conduct the training for ADC-specific operational activities. This includes course content, instructor materials, and student handouts.
External Sources	IE010: Online Data Sources	<p>Data from Online sources including:</p> <ul style="list-style-type: none"> • Online GIS • Online Property Tax Data • Web Mapping applications • Online sources of GQ Contact Information
31. Decennial Service Center Operation (DSC)	IE360: IT Service Outcome Notification	Notifications and status updates of IT service results provided to the users (requesters).

Provider	Information Exchange	Description
31. Decennial Service Center Operation (DSC)	IE577: Service Event Notification	Notifications to all users of a service event such as routine operations updates/changes, system problem/incident status or privacy/security incident status. Typically, these are provided as part of the standard message users receive when they call in for help.

2.3.2.2 ADC Operational Controls

Controls are the data that guide the behavior of the operation. They are not consumed by the operation, but rather they provide guidance, models, limits, criteria, cutoff dates, or other information that controls the way in which the operational work is performed.

Table 2 lists the controls for the ADC operation.

Table 2: ADC Operational Controls

Provider	Information Exchange	Description
1. Program Management Operation (PM)	Program Controls	Program Control information including: <ul style="list-style-type: none">• Budgets• Operational Plans and Schedule
3. Security, Privacy, and Confidentiality Operation (SPC)	Security, Privacy, and Confidentiality Controls	Laws, policies, regulations, and guidelines related to physical security, IT security, data security and privacy and confidentiality impacts, analyses, and processes. These include but are not limited to Title 13, Title 26, and other laws and policies related to protection of personally identifiable information.
32. Field Infrastructure Operation (FLDI)	IE367: Online and Classroom Training Schedules	Schedules for ADC-specific training classes.

Provider	Information Exchange	Description
6. Geographic Programs Operation (GEOP)	IE053: TEA Characteristics	Geographic Programs Controls including Type of Enumeration Area (TEA) Delineation.

2.3.2.3 ADC Operational Outputs

Outputs are the data produced by the operation. The outputs constitute the results of operational work that has been performed. Outputs produced may be used as inputs or controls to other operations.

Table 3 lists the outputs from the ADC operation.

Table 3: ADC Operational Outputs

Consumer	Information Exchange	Description
6. Geographic Programs Operation (GEOP)	<ul style="list-style-type: none"> IE021: MAF Updates IE022: ADC Spatial Updates 	Geographic Data outputs including: <ul style="list-style-type: none"> Address Update File (ADDUP) from In-Field Address Canvassing MAF Updates from In-Office Address Canvassing GQ/TL Updated TIGER Data
6. Geographic Programs Operation (GEOP)	IE023: ADC Geographic Products Requirements	Requirements for the Geographic Products created for use during Address Canvassing (ADC).
6. Geographic Programs Operation (GEOP)	IE028: In-Office Address Canvassing Attribution Data	New and updated values for BCU-specific attributes that are determined/identified during In-Office Address Canvassing work. These BCU attribute values are sent to GEOP/GD (Geographic Delineations) to be applied to the master BCU delineation records.

Consumer	Information Exchange	Description
32. Field Infrastructure Operation (FLDI)	IE250: Estimated Operational Workload (from ADC)	Estimate of the number of living quarters that will be enumerated within the field for each geographic area. This information is used by FLDI to create a model for estimating the staffing needs by location.
32. Field Infrastructure Operation (FLDI)	IE251: Operation-Specific Training Content and Requirements (from ADC)	Course content and other training requirements for the ADC-specific classroom training materials developed by FLDI.
32. Field Infrastructure Operation (FLDI)	IE252: Approved Operation-Specific Training Materials (from ADC)	Approval for training content and materials used to conduct classroom training for ADC-specific operational activities.
32. Field Infrastructure Operation (FLDI)	IE615: Time and Expense Records	Information regarding staff time and reimbursable expenses. Used by FLDI to pay employees.
32. Field Infrastructure Operation (FLDI)	IE616: Administrative Actions	Decisions regarding administrative changes for field and office staff made by field operation management. For example, field operations may decide to transfer an employee to another location. FLDI is responsible for documenting these actions in the appropriate systems.
33. Decennial Logistics Management Operation (DLM)	IE391: Operational Training Kit Requirements	List of the contents that should be included in the kits provided to the field staff in support of the In-Field Address Canvassing operation.

Consumer	Information Exchange	Description
33. Decennial Logistics Management Operation (DLM)	IE606: Field Ops Supplies and Materials Requests	Requests for additional supplies and materials required to support the field operation once the initial supplies provided in the operational training kit have been depleted.
1. Program Management Operation (PM)	<ul style="list-style-type: none"> • IE025: Paradata for Performance Reporting and Other Uses • IE026: MAFCS Reports 	Program Reporting information including: <ul style="list-style-type: none"> • QC Feedback • Paradata for Production Reports • Analysis Reports
31. Decennial Service Center Operation (DSC)	IE380: IT Service Requests	Requests for information or advice, or for a standard change (a pre-approved change that is low risk, relatively common and follows a procedure) or for access to an IT service.

2.3.2.4 ADC Operational Mechanisms

Mechanisms are the resources (people, places, and things) that are used to perform the operational processes. They include Staff Resources, Infrastructure Sites, Systems, and other Technology Infrastructure.

Staff Resources

Table 4 identifies the Staff Resources employed for the ADC operation.

Table 4: Staff Resources used within ADC Operational Activities

Staff	Description/Role
Headquarters (HQ) Staff	HQ staff manage the ADC operation and coordinate activities with NPC and Field Offices. HQ staff conduct MAFCS analysis work and operational assessments.

Staff	Description/Role
National Processing Center (NPC) Staff	NPC staff manage and conduct In-Office Address Canvassing clerical work.
Regional Office (RO) Staff	RO staff manage the MAFCS Field Data Collection work.
Regional Census Center (RCC) Staff	RCC/Puerto Rico Area Office (PRAO) staff manage all ADC decennial field operations within their designated census region.
Area Census Office (ACO) Staff	ACO staff manage all ADC decennial field operations within their designated area.
Field Staff	Census Field Supervisors (CFSs) and mobile Field Representatives (FRs) manage and conduct MAFCS Field Data Collection work. CFSs and listers manage and conduct In-Field Address Canvassing work.

Infrastructure Sites

Table 5 identifies the Infrastructure Sites employed for the ADC operation.

Table 5: Infrastructure Sites for ADC Operational Activities

Site Location	Description/Role
HQ	Used for Office Work and Data Center Hosting.
NPC	National Processing Center site used for In-Office clerical work.
RO	Regional Office. Used by permanent Census Bureau staff to manage operations within a designated region of the country.
RCC	RCCs used to manage all operations within their assigned geographic area. RCCs oversee activities of the ACOs. Each RCC will manage a number of ACOs. RCC sites also include the PRAO, which manages activities and operations unique to Puerto Rico and ACOs on the island.
ACO	ACOs used to manage all field operations and support activities within the designated area.

Site Location	Description/Role
Field Area	Locations in assigned Basic Collection Units (BCUs) and in transit to assignments.
Training Venues	Sites where field staff receive classroom training on both general administrative topics and In-Field ADC-specific topics.

Systems and other Technology Infrastructure

Table 6 identifies the Systems employed for the ADC operation.

Table 6: Systems used within ADC Operational Activities

System	Description
BARCA (Block, Assessment, Research, and Classification Application)	<p>BARCA is an interactive review tool that enables In-Office Address Canvassing staff to review the geographic landscape through imagery.</p> <p>BARCA allows analysts to assess and classify blocks by comparing housing units in 2009 imagery and current imagery, along with TIGER reference layers, MAF data and parcel boundary data. The BARCA incorporates the Census Bureau's TIGERWeb application as a web-mapping service to display TIGER features and reference layers. It also displays MAF data. In-Office Address Canvassing staff conducting both IR and ABR use the BARCA to conduct and status their work. Geography Division (GEO) and NPC use this tool to mark/flag areas of growth, decline, undercoverage, and overcoverage. This tool is also used to trigger blocks to different parts of the Address Canvassing process and for In-Field Address Canvassing.</p>
BTD (Block Tracking Database)	The BTD stores block-level status and characteristic information.
CDL (Census Data Lake)	The CDL serves as the centralized repository for decennial response data and paradata. It allows distributed processing capabilities for cost and progress reports and other downstream consumers. CDL is a flexible data management platform intended to provide the Census Bureau with a next-generation scaling capability to fulfill data management, storage, reporting, analytics, and security requirements while reducing costs associated with duplicative data silos.

System	Description
DAD (Dangerous Address Database)	The DAD stores addresses that field staff have identified as dangerous. Flagged addresses are not excluded from current surveys or censuses, however field representatives and enumerators receive training on safely handling and reporting these addresses.
ECaSE FOCS (Enterprise Censuses and Surveys Enabling Platform Field Operational Control System)	Enterprise solution that supports 2020 Census operational work. For ADC, ECaSE is used for work assignment and schedule management for the In-Field Address Canvassing work (ECaSE-FOCS). FOCS includes Work Availability and Time and Expenses modules, which are used for fieldwork management. The Work Availability module is used for schedule management, and the Time and Expenses module is used to manage payroll.
ECaSE SOCS (ECaSE Survey Operational Control System)	Enterprise solution that supports 2020 Census operational work. For ADC, ECaSE is used to create the universe for the In-Field Address Canvassing work and maintain operational workloads as data collection proceeds (ECaSE-SOCS).
Geospatial Services	Census services that provide imagery and other spatial data for use in operations supporting both In-Field Address Canvassing and In-Office Address Canvassing operations.
GWCS (GSS Workflow Control System)	The GSS Workflow Control System is used to review the availability and status of GSS partner file acquisition and processing.
LiMA (Listing and Mapping Application)	A single, scalable, automated corporate instrument that enables FRs/listers to capture and provide accurate listing and mapping updates to the MAF/TIGER System. LiMA displays an address record for each known living quarter in the assigned BCU. LiMA also displays a map of the BCUs in the surrounding area to orient the FR/lister and allow for the collection of a MAF structure point (MSP), or “map spot.”

System	Description
LMS (Learning Management System)	The LMS is a cloud-based automated training application for the administration, tracking, reporting and delivery of online training content to manage the learning process. The LMS is configured by an integration vendor. The online training content uploaded to the LMS is developed by internal headquarters staff and outside vendors.
MaCS (Matching and Coding Software)	MaCS is a system used to match and/or geocode various types of address records. Its base functionality is the starting point for multiple projects, such as In-Office Address Canvassing GQ/TL Review and LUCA Address Validation. MaCS is customized for each individual operation to meet its needs. Some of its base functionality includes matching against MAF and TIGER extracts, searches of Administrative Records, and a mapping utility.
MAF/TIGER (Master Address File/ Topologically Integrated Geographic Encoding and Referencing System)	<p>The MAF/TIGER System provides the corporate address list, the map data, the geocoding service, and the distribution of related geographic and address products either by electronic or paper means. Specific MAF/TIGER subsystems used by the Address Canvassing operation include the GATRES, MAF Browser, and MTAG.</p> <ul style="list-style-type: none"> GATRES (Geographic Acquis-based Topological Real-time Editing System): GATRES is a Census Bureau system within MAF/TIGER that is used to interactively update information in the MAF/TIGER System. GATRES allows concurrent access to the MAF/TIGER System by multiple simultaneous interactive users and is accessible from multiple sites, including the Census Regional Offices and NPC. For the In-Office Address Canvassing, GEO will continue to enhance GATRES to enable the ABR staff to provide address updates for a particular block. GEO and NPC use this system to edit MAF data marked in BARCA for review. MAF Browser: The MAF Browser is a software tool within the MAF/TIGER System that allows a user to easily search the complex MAF database and return filtered results in a web browser. ABR staff use the MAF browser to research specific addresses as they compare information from local files to the MAF.

System	Description
	<ul style="list-style-type: none"> • MTAG (MAF/TIGER Address Geocoding Application): MTAG is a part of the MAF/TIGER System that is primarily used to help resolve ungeocoded, residential Master Address File (MAF) addresses from the U.S. Postal Service Delivery Sequence File (DSF) as part of UR. Staff view information in the MTAG System for the individual address record. Staff update TIGER using the Geographic Acquis Based Topological Real-time Editing System (GATRES) and use quality local source address information to determine the appropriate resolution for each record.
MCM (Mobile Case Management)	<p>MCM provides mobile device-level survey case management and dashboards. MCM also manages data transmissions and other applications on the mobile device. FRs and listers use MCM to view assignment information about blocks and BCUs. MCM enables FRs and listers to:</p> <ul style="list-style-type: none"> • Receive block/BCU assignments • Launch the LiMA in order to work a block/BCU assignment • Transmit completed block/BCU assignments
MOJO Route Optimizer	<p>MOJO Route Optimizer is a Census Bureau-specific operational control system that manages In-Field Address Canvassing work assignments to optimize efficiency. This system uses automation to support the scheduling, workload assignments and management processes of field data collection efforts. It provides optimization of caseloads handled by listers and enumerators through a Geographic Information System (GIS) to maximize productivity. Enumerators and listers receive optimized workloads through the ECaSE application on a smart mobile device. Enumerators and listers are able to view their assignment list and map, which provides their optimized daily workload of contact attempts, and track status and closed cases for the day.</p>

System	Description
ROSCO (Regional Office Survey Control System)	<p>ROSCO is the Census Bureau control system used for most census surveys as well as Demographic Area Address Listing (DAAL). ROSCO provides the ability to:</p> <ul style="list-style-type: none">• Maintain a current list of field staff• Create and release work assignments• Reassign work• Monitor progress with daily reports at the appropriate supervisor level• Review and evaluate completed work• Report technical problems to the Technical Assistance Center (TAC)• Close out assignments• Send staffing reports to headquarters <p>For ADC, ROSCO is used to control the MAF Coverage Study work.</p>
SOA (Service Oriented Architecture)	<p>A software component of Oracle Fusion Middleware (which is collection of software products used to support development, deployment, and management of system applications and databases) that provides application and service integration across cloud, mobile, and internet platforms. It has an architectural solution which application components provide services to other components via a communications protocol, typically over a network. The Census system developed enhancements to the production system to support interfaces between ECaSE systems in the Cloud and non-Cloud systems.</p>
SMaRCS (Sampling Matching, Review Coding System)	<p>SMaRCS is used to create QC samples and provide reports after the QC work is complete.</p>

System	Description
UTS (Unified Tracking System)	A data warehouse that combines data from a variety of Census Bureau systems, bringing the data to one place where the users can run or create reports that allow them to analyze survey and resource performance. This role-based system provides case-level tracking across modes, drill down capability, and most importantly, pulls cost data into the same system for more efficient cost impact assessment. The UTS extracts data from feeder systems daily, providing the users with near real-time data.

Other Technology Infrastructure employed for the ADC operation includes:

- Census Network connectivity for data transmission between operational systems and operational sites. This connectivity is provided by ITIN.
- Mobile Network for data collection activities using the mobile devices. This network is provided by ITIN.
- Mobile devices (laptops, tablets, smartphones) used by the field staff to record the ADC status and enumerate occupied HUs. These devices are provided by ITIN.
- Office IT Infrastructure at headquarters, RCCs, ACOs, and NPC for conducting ADC operational work. This infrastructure is provided by ITIN.
- Kits/field supplies that field staff will use for data collection activities. These kits/field supplies are provided by DLM.

2.4 ADC Data Flow and Operational Influences

Figure 2 is an Integrated Operations Diagram (IOD), which depicts the major interactions among the operations and external entities involved in the development of the 2020 Census Frame (address and spatial data). This diagram shows the Geographic Programs operation (GEOP) as the hub of frame development and GEOP's interactions with the other 2020 Census operations that have a role in frame development. GEOP is composed of three components: Geographic Delineations component (GEOP/GD), Geographic Partnerships component (GEOP/GP), and Geographic Data Processing component (GEOP/GDP). Also shown are the upstream and downstream operational influences, including the Address Canvassing operation (ADC), Local Update of Census Addresses operation (LUCA), Redistricting Data Program operation (RDP), Response Processing operation (RPO), Count Review operation (CRO), Data Products and Dissemination operation (DPD), and Archiving operation (ARC).

This diagram covers frame development for the 2020 Census (stateside and Puerto Rico). It does not cover development of the frame for the Island Area Censuses or Post-Enumeration Survey operations.

The discussion below walks the reader through the diagram, using the circled numbers to help the reader follow the flow.

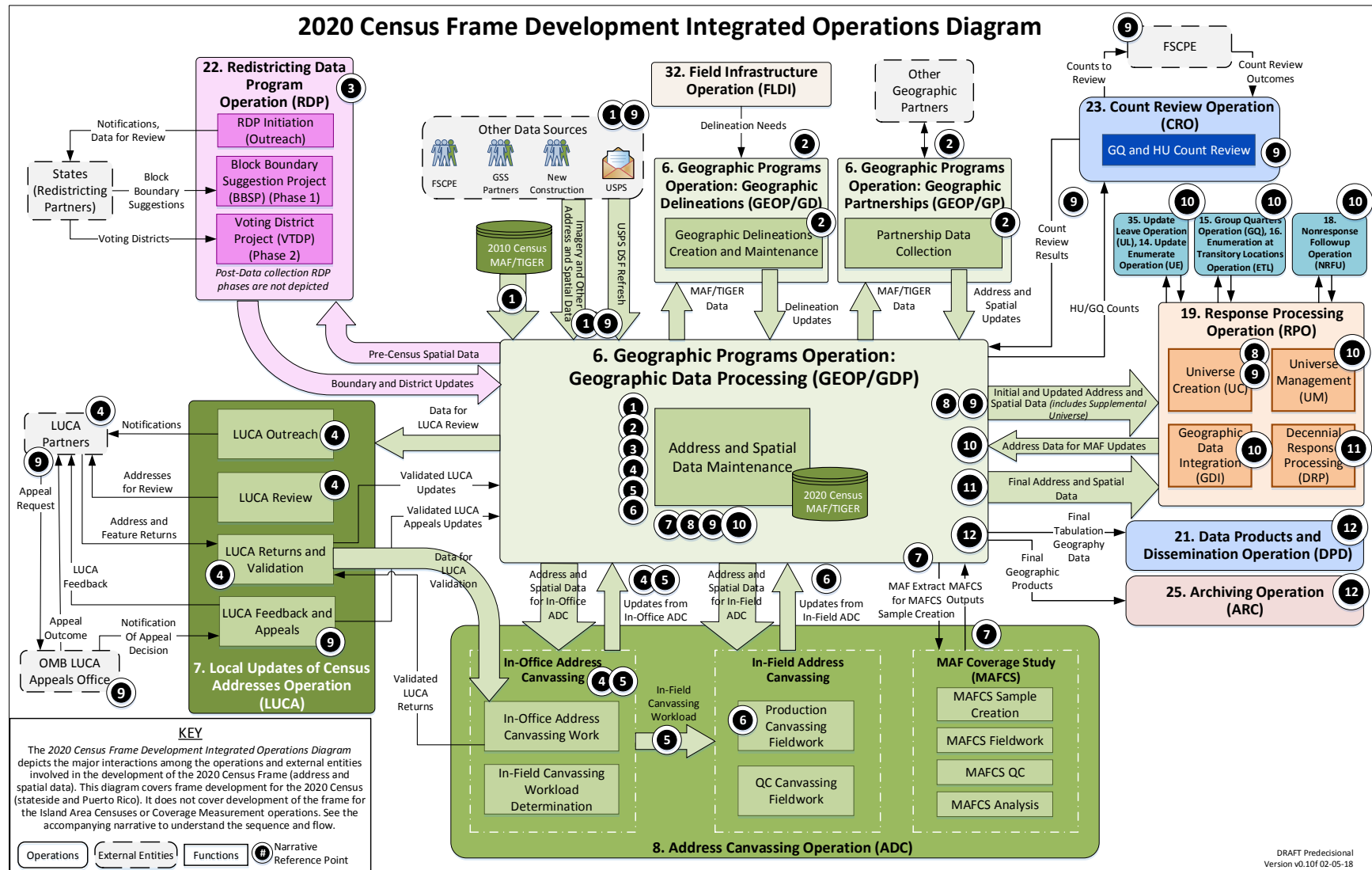


Figure 2: 2020 Census Frame Development Integrated Operations Diagram

① Frame development for the 2020 Census includes, as a starting point, the 2010 Census address and spatial data from the 2010 Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) database and any ongoing updates that have been performed throughout the early part of the decade. Frame development takes inputs from various external sources to update the address and spatial data in the MAF/TIGER system.

The United States Postal Service (USPS) typically provides data to the Census Bureau twice a year, in the spring and the fall, via the Delivery Sequence File (DSF). The DSF is the list of all addresses (and some related data) maintained by the USPS for mail delivery and is the most complete USPS address database available. GEOP processes the DSF with other data from the USPS through an activity collectively known as the “DSF Refresh.”

Other sources, such as Federal-State Cooperative for Population Estimates (FSCPE) and Geographic Support System (GSS) Partners provide data to GEOP/GDP, which is used in validating and updating the MAF/TIGER data. Based on data from all these sources, GEOP/GDP updates the MAF/TIGER data throughout the decade.

② The Geographic Programs operation/Geographic Partnerships project (GEOP/GP) performs outreach activities to encourage and motivate participation in the Geographic Partnership Programs. Partner groups, including tribal, state, and local governments, and coordinating agencies, provide address and spatial data updates to GEOP/GP, which sends them to Geographic Programs operation/Geographic Processing (GEOP/GDP) to update the MAF/TIGER data.

The Geographic Programs operation/Geographic Delineations project (GEOP/GD) determines, delineates, and updates the geographic area boundaries for 2020 Census data collection and tabulation. GEOP/GD performs the delineation of various Collection Geography areas, based on the Basic Collection Unit (BCU), the smallest unit of collection geography for all 2020 Census listing-based operations. In an effort to ensure the most cost-effective and efficient process to enumerate households, every BCU in the United States is assigned to one specific Type of Enumeration Area (TEA). The TEA assignment for a given BCU is based on address types and other characteristics of the BCU, including an assessment of the likelihood of residents to self-respond and accessibility of the BCU. The TEA assignment determines the methodology used for frame creation and enumeration of the households within the BCU. GEOP/GD also supports Field Management Area (FMA) delineation, which includes delineation of geographic areas necessary to manage and accomplish the fieldwork for the 2020 Census. In addition to the collection geography delineation work described above, GEOP/GD is also responsible for 2020

Census Tabulation Geography delineation. Tabulation Geography delineation data are used by DPD at the conclusion of the 2020 Census during the creation of the 2020 Census data products. GEOP/GDP updates the MAF/TIGER data to reflect both these kinds of delineations.

GEOP/GP and GEOP/GD activities begin in 2016 and are ongoing throughout frame development.

③ In addition to inputs provided by partners through the GEOP/GP component, the 2020 Census includes an operation, Redistricting Data Program (RDP), which provides each state the opportunity to identify the small area geographies needed for legislative redistricting and the legally required Public Law (P.L.) 94-171 redistricting data tabulations by the mandated deadline of April 1, 2021, one year from Census Day. RDP includes activities to update the frame with current block boundary suggestions (2015 – 2017) and voting district project inputs (2017 – 2020).

Once RDP establishes which states will participate, it sends those states packages, including precensus spatial data that reflect the boundaries and features in the MAF/TIGER data. The participants update these shapefiles and provide them back to RDP, which reviews them and resolves any issues. Once reviewed, the updated files are provided to GEOP/GDP for use in updating the MAF/TIGER data.

④ Another operation is Local Update of Census Addresses (LUCA). LUCA provides an opportunity for tribal, federal, state, and local governments to review and improve the address lists and maps as required by P.L. 103-430. LUCA sends an advance notice package to approximately 39,000 state, local, and tribal governments informing them about LUCA. LUCA participants that have signed an agreement to protect the Title 13 data contained in the Census Bureau address files are provided review materials, including shape files and address data from MAF/TIGER for review. The material provided for LUCA review includes some MAF/TIGER updates from the ongoing In-Office Address Canvassing (ADC) work. The LUCA participants review the materials and provide any updates as address and feature returns. Address matching is used to match and flag returns for validation as needed. 2020 Census LUCA addresses that are not validated during address matching are sent to ADC for in-office validation. In-office validation results are returned to LUCA. LUCA provides updates for validated addresses from LUCA partner returns to GEOP/GDP for use in updating the MAF/TIGER data. Addresses that were not validated are subsequently sent back to LUCA partners as part of the LUCA feedback activity.

⑤ A critical part of frame development is ADC. ADC's purpose is to deliver a complete and accurate address list and spatial database for enumeration and determine the type and address characteristics for each living quarter. ADC comprises three main functions: In-Office Address Canvassing, In-Field Address Canvassing, and the MAF Coverage Study (MAFCS).

In-Office Address Canvassing is a continuous process that measures, assesses, and ensures the completeness and accuracy of the MAF and associated attributes and geospatial data. In-Office Address Canvassing, which began in September 2015 and continues during the frame development process, receives address and spatial data from GEOP/GDP. External updates to these data that occur during ADC are sent on an ongoing basis from GEOP/GDP as new information is provided by activities such as GEOP/GP and LUCA.

Any updates to address and spatial data resulting from In-Office Address Canvassing are provided to GEOP/GDP for incorporation into the MAF/TIGER data.

The BCUs that cannot be validated through In-Office Address Canvassing procedures or for which address characteristics cannot be adequately determined are sent to the field for in-person canvassing and become part of the In-Field Address Canvassing workload.

⑥ In-Field Address Canvassing is the process of having field staff visit specific geographic areas to identify every place where people could live or stay. Field staff compare what they see on the ground to the existing census address list and either verify or correct the address and location information. Listers knock on every door to verify address information, collect associated mailing address information, and collect information about any additional housing units present at the address. Field staff also classify each living quarter as a housing unit, group quarter, or transitory location. The results are made available to GEOP/GDP to update the MAF/TIGER data.

⑦ The MAF Coverage Study (MAFCS) is a recurring address canvassing operation to statistically determine the over/under coverage for the entire frame. MAFCS began in April 2016 and work continued until April 1, 2017. GEOP/GDP provides an extract of addresses from the MAF for the MAFCS to sample. The MAFCS performs field-work and analyzes the sample to determine any overcoverage and undercoverage issues resulting from the In-Office Address Canvassing work. The results of the MAFCS are used to improve In-Office Address Canvassing procedures.

⑧ GEOP/GDP provides initial address and spatial data, including the TEA designations and the field management area delineations to the Response Processing operation (RPO) so it can create the initial enumeration case universe. RPO uses this information to create workload for each of the data collection operations, including the Forms Printing and Distribution operation

(FPD), Internet Self-Response operation (ISR), Census Questionnaire Assistance operation (CQA), Nonresponse Followup operation (NRFU), Update Leave operation (UL), Update Enumerate operation (UE), Group Quarters operation (GQ), and Enumeration at Transitory Locations operation (ETL).

9 Additional updates to the MAF/TIGER data may be identified after the initial universe is sent to RPO as a result of the LUCA appeals, New Construction, the Count Review operation (CRO), and subsequent refreshes of USPS DSF data. These data are provided to RPO in what is known as the Supplemental Universe.

LUCA includes an appeals process to allow participants to contest the Census Bureau's responses to their inputs. Once LUCA participants receive their feedback materials, they have 30 calendar days to file an appeal with the LUCA Appeals Office within the Office of Management and Budget (OMB). Upon receipt of a LUCA appeal, the LUCA Appeals Office uses the supporting documentation sent by the participant to decide whether to accept or reject an appeal. Once OMB makes a determination on a LUCA appeal, it notifies the participant of the determination. The LUCA Appeals Office delivers accepted LUCA appeals to GEOP/GDP, which processes the appealed addresses, updating the MAF/TIGER data accordingly.

The New Construction project utilizes the expertise of tribal, state, and local governments to improve the accuracy and completeness of the address list used for the 2020 Census. The purpose of the New Construction project is to obtain city-style addresses for newly built housing units (HU) in blocks where census questionnaires are delivered through the self-response method. New addresses for units outside the self-response area will be added to the address list at the time of questionnaire delivery in Update Leave areas or during the enumeration attempt in Update Enumerate areas. The Census Bureau asks participants in the New Construction project to submit addresses of any HU for which basic construction (closing the structure to the elements) will be completed by and/or before Census Day (April 1, 2020).

CRO, in partnership with FSCPE, enhances the accuracy of the 2020 Census through remediating potential gaps in coverage by implementing an efficient and equitable process to identify missing housing units, and identifying and correcting missing or geographically misallocated large group quarters (GQ) and their population. For frame development, GEOP/GDP sends HU and GQ counts to CRO for validation. Any address changes resulting from CRO are incorporated into the MAF/TIGER data by GEOP/GDP.

10 Additional frame development support is provided by address updates from UL, UE, GQ, and Enumerations at Transitory Locations (ETL), and from NRFU's field verification activities. As noted above, universe and address updates occur during field operations. All listing results and other address changes identified through the field data collection operations are sent back to GEOP/GDP through the RPO Geographic Data Integration function.

11 Once data collection is complete, the final address and spatial data are sent from GEOP/GDP to the RPO Decennial Response Processing Function, which uses the geographic data to prepare the response data for subsequent tabulation and data products creation activities.

12 The final geographic data files (Tabulation Geography data) are sent from GEOP/GDP to DPD to be used in the creation of the various 2020 Census data products. DPD uses this geographic data to determine how to structure and layer the data by geographic area (e.g., state, city, and tract).

At the conclusion of the 2020 Census, ARC receives final geographic products from GEOP/GDP frame development to be transferred to the National Archives and Records Administration (NARA) as required.

2.5 Address Canvassing Design Assumptions

The sections below present a discussion of the workload assumptions and current workload estimates relating to the Address Canvassing Universe.

2.5.1 Block Universe

Census Bureau address listing work is traditionally conducted and managed within the confines of a census block. Blocks define specific geographic areas bounded by features. Data collection previously occurred within a collection block.

Census blocks are statistical areas bounded by visible features, such as streets, roads, streams, and railroad tracks, and by nonvisible boundaries, such as selected property lines and city, township, school district, and county. Generally, census blocks are small in area. For example, a block in a city is bounded on all sides by streets. Blocks in suburban and rural areas may be large, irregular, and bounded by a variety of features, such as roads, streams, and transmission lines. In remote areas, census blocks may encompass hundreds of square miles. Census blocks nest within all other tabulated census geographic entities and are the basis for all tabulated data.

In general, the types of blocks as described above are referred to as tabulation blocks. For the purposes of field data collection, the census has historically worked within the confines of collection blocks. Collection blocks are similar to tabulation blocks, but they are bounded by only visible features to the extent possible. This allows field workers to easily observe their boundaries while conducting work.

The Census Bureau has tested the use of a new type of collection geography for the 2020 Census known as the Basic Collection Unit (BCU). The BCU replaces both the collection block and assignment area geographies that operations used for the 2010 Census. BCUs are designed to be

more dynamic than collection blocks, so can change according to housing growth and decline to allow listers to work specifically in areas of change. This change is expected to allow the Census Bureau to better isolate and target areas of change that require listing. In short, where collection operations used blocks and assignment areas for the 2010 Census, they will use the BCU for the 2020 Census. The BCU will serve as the fundamental unit of fieldwork assignment for all 2020 Census operations when appropriate. This change was successfully tested during the Address Canvassing Test in FY 2017.

The current block universe for each component of Address Canvassing is as follows:

- In-Office Address Canvassing: Currently conducts work within the confines of the 2010 Census tabulation block (uses a block to BCU crosswalk to produce comparable results for fieldwork).
- MAF Coverage Study: Conducts work within the confines of the 2010 Census tabulation block; this could change to BCUs in future MAFCS efforts.
- In-Field Address Canvassing for the 2020 Census: Conducts work within the confines of the BCU (though these are still referred to generically as “blocks” by field staff).

For the remainder of this document both of these types of collection units (tabulation block or BCU) are simply referred to as blocks unless otherwise specified.

2.5.2 Address Universe

The initial address universe for all Address Canvassing operations is supplied by the MAF. The address list does not include the complete list of addresses from the MAF. Instead, the addresses represent a subset of the MAF that satisfy specific requirements. The requirements are referred to as the address filter. In general, census operations exclude the following types of addresses from the address list:

- Ungeocoded addresses.
- Duplicate addresses.
- Nonresidential addresses.
- Addresses that do not contain sufficient information to determine location on the ground.

The Census Bureau intends to keep the address universe as up-to-date as possible so that address canvassing results will be available for all downstream listing and enumeration operations. However, the In-Office Address Canvassing universe requires a complete inventory of all structures, commercial and residential, in order to accurately compare MAF data to local files, as well as to perform geocoding on ungeocoded records. Therefore, the nonresidential addresses and the list of ungeocoded records are made available during In-Office Address Canvassing work to ensure that these addresses are updated as needed.

2.5.3 Address Canvassing Workload Estimates

Current workload estimates for each of the Address Canvassing component operations are included below.

2.5.3.1 In-Office Canvassing Workload

The IR component of In-Office Address Canvassing conducts imagery review to identify coverage problems on all 11 million tabulation blocks. A subset of blocks reenters this process for rework based on “triggers” for newly available reference imagery for cases not previously reviewed because of poor or absent imagery, as well as cases in which updated data (such as a DSF refresh process) has indicated change has occurred within a block. Triggers can also be used to send blocks for In-Field Address Canvassing and to re-review areas that have been affected by natural disasters.

The ABR component of In-Office Address Canvassing was designed to resolve the coverage problems identified in IR. The original workload estimate was 1.7 million blocks. The ABR component was in place between July 2016 and February 2017, when it was discontinued after processing about 72,000 blocks.

The UR component of In-Office Address Canvassing is designed to assign a block location, or geocode, to every residential address currently lacking a geocode in the MAF (covering approximately 2.8 million addresses). In-Office Address Canvassing Group Quarters/Transitory Locations works to update data for GQ and TL addresses within the MAF and whose workload was projected in July 2017 to include about 212,000 addresses (including Puerto Rico). The LUCA Address Validation project validates address data submissions from LUCA participants; workload depends on partners’ submissions.

2.5.3.2 MAF Coverage Study Workload

The MAFCS was planned to have a consistent, national block workload to support the creation of coverage estimates. The MAFCS was designed to work with the Community Address Updating System (CAUS) program to select blocks for fieldwork. Originally, it was planned that the MAFCS and CAUS would combine to canvass approximately 20,000 blocks each year. The address workload was planned to vary based on the block sample, but included approximately 1 million addresses in FY 2016. The MAFCS was discontinued on April 1, 2017.

2.5.3.3 In-Field Canvassing Workload

The In-Office Address Canvassing results will determine the In-Field Address Canvassing workload for the 2020 Census. The current planning estimate is that approximately 30 percent of addresses in Type of Enumeration Area (TEA) 1 areas will be included in the In-Field Address

Canvassing workload. Blocks to be sent for In-Field Address Canvassing will be determined using TEA status, block status (Active, Passive, or On Hold), and various trigger criteria.

The Census Bureau expects that the In-Office Address Canvassing process and other continuous MAF update processes (i.e., GSS activities) will continue to resolve MAF coverage problems through the 2019 cutoff date to create the In-Field Address Canvassing workload. The Census Bureau will continue to refine rules for In-Field Address Canvassing workload eligibility and monitor In-Office Address Canvassing activities in order to improve the In-Field Address Canvassing workload estimates.

Based on funding uncertainty and reprioritization of critical components of the 2020 Census, both the ABR and the MAFCS activities were discontinued in 2017. The discontinuation will result in a larger workload being sent to In-Field Address Canvassing. As a result, it is currently estimated that 30 percent (rather than 25 percent) of addresses will require In-Field Address Canvassing.

2.6 Additional Background on 2020 Census Address List Development

Although the Address Canvassing operation is a key address list development activity leading into the 2020 Census enumeration, it does not work alone to assure a complete and accurate list. The 2020 Census address list development started soon after the Census Bureau finalized the 2010 Census count of living quarters. The Census Bureau retains the 2010 Census addresses in the MAF, and they are subject to continuous updates from the DSF, as well as new sources, to support the 2020 Census. In contrast to the previous decade, the 2020 Census did not wait until just prior to enumeration to supplement the address list where necessary. For example, an initiative for the Geographic Support System (GSS) program started work to improve the address frame in FY 2011. The GSS and the DSF, in conjunction with the Address Canvassing operation, will update the frame throughout the decade.

This section describes:

- Address list updating activities that have been completed to date and how the results inform us about the quality of the current MAF.
- Address list updating activities that are planned and how those activities integrate with the Address Canvassing operation.

2.6.1 The Early Years (2010-2014)

2.6.1.1 The 2010 Census Address List

There were 131.7 million housing units in the final 2010 Census count. The addresses for these units established the base for the 2020 Census address list. The 2010 Census address list will comprise the vast majority of the 2020 Census address list in most areas of the United States and Puerto Rico. In the previous decade, the Census Bureau observed that approximately 77 percent of the final 2010 address list addresses were included in Census 2000.

For the 2010 Census, 96.7 percent of the addresses included in the final address list were city-style (house number, street name) and 3.3 percent were non-city-style (for example, rural route, post office box, or general delivery) (Census Bureau, 2014). For Census 2000 and the 2010 Census, the principal sources of address data in city-style areas were the DSF and Census Bureau field activities, including address listing for the decennial census and the ACS.

2.6.1.2 United States Postal Service File Updates

The USPS is the authoritative source for mail delivery addresses and postal codes in the United States and Puerto Rico. The USPS shares its address list, the DSF, with the Census Bureau in accordance with Public Law 103-430, the Census Address List Improvement Act of 1994. The Census Bureau used the USPS data as a source for creating the initial MAF for Census 2000 and continues to use the DSF data to update the MAF regularly. The USPS typically provides the data to the Census Bureau twice a year, in the spring and the fall.

The DSF is the list of all addresses (and some related data) maintained by the USPS for the purpose of mail delivery. The Census Bureau also uses the Locatable Address Conversion Service (LACS) file from the USPS, which identifies known address conversions. These conversions can represent city-style to city-style address conversions as well as rural route to city-style conversions. The MAF/TIGER System processes the DSF and LACS, along with other data from the USPS, through a project collectively known as the "DSF Refresh." The DSF Refresh includes the following general steps:

- Match the new DSF file to the MAF to update existing MAF addresses with DSF source information and add new, unmatched DSF addresses to the MAF.
- Process the USPS Zone Improvement Plan (ZIP) code file to update existing ZIP codes for all addresses on the MAF³, even those addresses that did not originate from the DSF.
- Process the LACS file to account for address conversions.

³ In TIGER, address ranges and their associated ZIP codes are assigned to each street feature segment.

- Attempt to assign DSF addresses to a census block (i.e., run the geocoding process).

The last step is critical for inclusion of the addresses in the census. The block provides a physical location (geographic area) for census workers to visit during in-field enumeration activities, and all census data tabulations are created at the block level. If the DSF address matches an existing MAF address that already has a census block assignment, then the DSF address is geocoded. For those DSF addresses that have no matches to an existing MAF address, the MAF/TIGER System compares the address number to address ranges in TIGER in an attempt to assign the address to a census block code. In some cases, the street feature or house number range may not exist in TIGER, and the DSF address remains on the MAF without a census block. The Census Bureau refers to these addresses as ungeocoded addresses.

The DSF adds approximately 500,000 addresses to the MAF every six months. The adds are predominantly attributed to the expansion of urban developments on undeveloped land near a city or its suburbs. The Census Bureau does not use all records on the DSF to update the MAF. The update specifically excludes non-city-style addresses, including Post Office Box addresses and rural routes. The inability to link these types of addresses to a physical geographic area is the reason for the exclusion.

DSF Stability Index

The DSF Stability Index provides an indicator of the stability of addresses in the DSF over a specified duration. The DSF Stability Index is calculated by tracing the presence of addresses in the DSF at the end of the period through each preceding DSF for the time period. Index values range from zero to one; an index value of one indicates that each address in the final DSF for the time period appears in each preceding DSF. The higher the index value the greater the stability of addresses in the DSF. Census tracts with the highest levels of stability tend to be located in urban and suburban areas. The DSF Stability Index provides one measure of stability and has been used with other measures of stability, coverage, and quality in decision-making for the Address Canvassing operation.

2.6.1.3 American Community Survey

The ACS conducts field visits every month to interview residents in households that did not respond to the survey. During that visit, field representatives (FRs) confirm the address information and block location (geocode) of each address. The ACS program collects and reviews these updates and sends them to the MAF/TIGER System twice a year to update the MAF. This process occurs for housing units (HU) and GQs separately. The Census Bureau refers to these updates as the ACS Time of Interview (TOI) MAF updates. The ACS TOI corrects existing housing unit and GQ addresses but does not add new addresses during the interview. However, GQs are added as a result of ongoing office research activities that ACS conducts in support of a quality GQ frame. These updates from both ACS TOI and In-Office research will continue throughout the decade.

2.6.1.4 The Geographic Support System

The Geographic Support System (GSS) is an integrated program of improved address coverage, continual spatial feature updates, and enhanced quality assessment and measurement. Its activities contribute to the MAF/TIGER System improvement. GSS research and analysis results support the combination of In-Field and In-Office Address Canvassing methods as outlined in this document. The Census Bureau, with tribal, federal, state, and local governments, as well as third-party data providers and all users of MAF/TIGER data, are major participants in the program. The Geographic Support System Partnership Program began in FY 2011 and has a 10-year lifecycle.

In 2012, the GSS Partnership Program prioritized outreach to partners based on characteristics of the MAF addresses for their area. The objective was to determine whether the GSS could obtain files from partners in sparsely populated rural areas to confirm that the MAF had sufficient and accurate coverage in areas with low QIs. The GSS Partnership Program solicited tribal, state, and local governments within these parameters to submit address and road data.

Address Source Evaluation Operation

Once GEO receives partner data, a geographer examines each partner file, inventories the contents, and determines whether the file complies with data content guidelines for addresses and roads. Prior to using the partner-provided data, GEO conducts a series of automated checks and analytic reviews. This process includes matching partner addresses to the MAF, interactively reviewing nonmatches to avoid duplication in the MAF, and validating that new addresses represent structures that actually exist on the ground. GEO refers to this entire process for reviewing and updating the MAF with partner data as the Address Source Evaluation (ASE) operation.

Address Canvassing Recommendation

The GSS Partnership Program results, as documented in the *Geography Division Address Canvassing Recommendation* report (Census Bureau, 2014), offered the following conclusions about the availability and utility of partner data:

- The Census Bureau is more likely to acquire partner address and road data in urban and suburban areas, many of which are likely to show growth. This supports the notion that partner data can be used to both validate and supplement the MAF/TIGER System data in these areas.
- The Census Bureau is less likely to acquire and successfully process partner data for sparsely-populated rural areas containing non-city-style addresses. The Census Bureau explored alternative methods to supplement the address list in these areas (for example,

with third-party data and possibly addresses from administrative records) but, as of summer 2017, no adequate sources for these types of addresses have been identified.

- Partner data adds and modifies roads at highly variable rates. In some areas, GEO made only few updates to roads in the MAF/TIGER System because the road data were already current and of high quality. In other areas, such as new housing subdivisions, adding roads made it possible to geocode the new housing units.
- Matching partner-provided address data to the MAF/TIGER System reduced the number of ungeocoded addresses. Ungeocoded addresses are not included in the census frame because, without a census block location, the enumeration data associated with the address cannot be tabulated to the correct jurisdiction and census block. When ungeocoded addresses are resolved, the coverage for that area improves and there is less need to conduct In-Field Address Canvassing.

2.6.2 Middecade and Beyond (2015-2020)

2.6.2.1 Continued Geographic Support Systems Work

Moving forward into Fiscal Year 2018, the goal of the GSS program is to collect and process local partner data and third-party data for the remainder of the nation. It is possible that many areas do not have local data to share. These partners will be cataloged in the GSS Workflow Control System (GWCS) so that the GSS can work with them to obtain data in the future. The GSS will continue to work to supplement data in these areas with usable third-party data.

The GSS will continue to work to acquire and process files from new partners, as well as acquire new files from existing partners when needed. The acquisition needs are determined by the following factors:

- Living quarters growth identified by In-Office Address Canvassing processes.
- An agreement with state providers to provide data on a regular cycle.

The GSS will also continue to research the availability of usable third-party data in areas where local files are not available. At the end of FY 2015, the Census Bureau purchased address data from five vendors and national street centerline spatial data from one vendor for 2020 Census work. An evaluation of these data found that the MAF was far more comprehensive than these commercially available lists.

All of these activities will continue in the years leading up to the 2020 Census to support In-Office Address Canvassing and overall frame development.

GSS Results to Date

Figure 3 depicts the areas for which GSS partners have provided files by the type of data provider. Areas in white represent areas where the GSS does not currently have partnership coverage as of September 30, 2017.

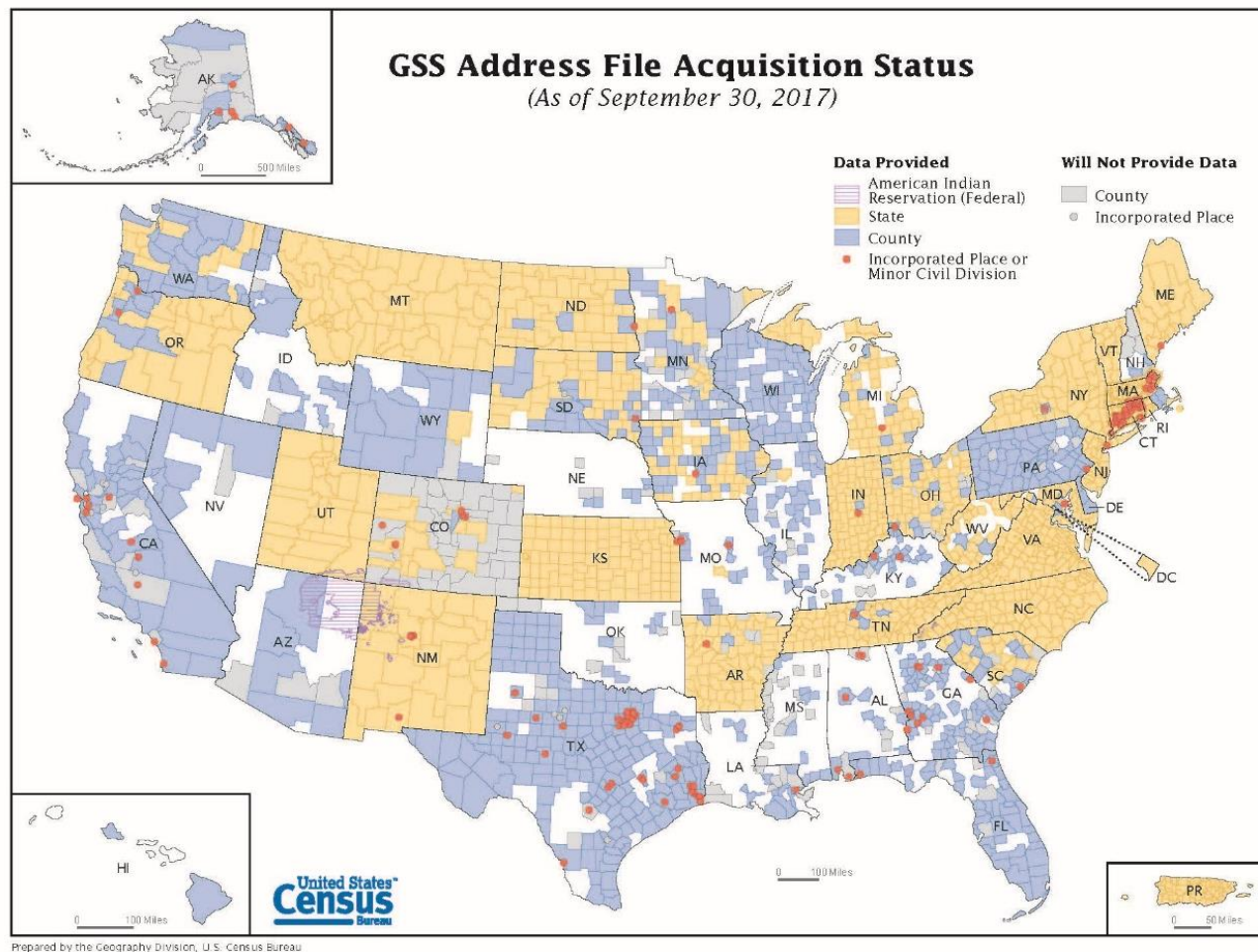


Figure 3: GSS Address File Acquisition Status, by Data Provider

The GSS Partnership Program has been successful at acquiring, evaluating, and incorporating current, high-quality address and road data. As of September 30 2017, Census Bureau has acquired data from 1,459 partners including 38,160 governmental entities covering 88.8 percent of the housing units and 89.0 percent of the population in the 2010 Census.

Table 7 presents the results of the ASE operation for partner provided addresses.

Table 7: Results of the Address Source Evaluation for Partner Provided Files

MAF Update Category	Number	Percent of Total
Total Addresses Provided	100,690,733	100.00
Matched to the MAF	80,039,155	79.5
Added to the MAF	292,471	0.3
Rejected	20,359,107	20.2

Results as of August 2017

The vast majority of partner provided addresses—approximately 80 million (or 79.5 percent)—matched to an existing MAF address record. Some of the matched address records were previously ungeocoded (i.e., did not have a census block code). The total number of previously ungeocoded records in the MAF/TIGER System that obtained a block geocode as a result of the partner provided update amounts to 1,405,977, or approximately 1.4 percent of the partner-provided addresses. Another 0.3 percent of the partner provided addresses were unmatched but geocoded, and added to the MAF as a new address record. The remaining 20.2 percent (20.36 million) unmatched addresses were rejected and not updated on the MAF. Major reasons for rejection include:

- Records in the partner file were identified as duplicates.
- Records in the partner file did not have a complete city-style address.
- Records in the partner file were missing information needed for the MAF/TIGER System, such as unit type.

2.6.2.2 Federal Administrative and Third-party Data Files

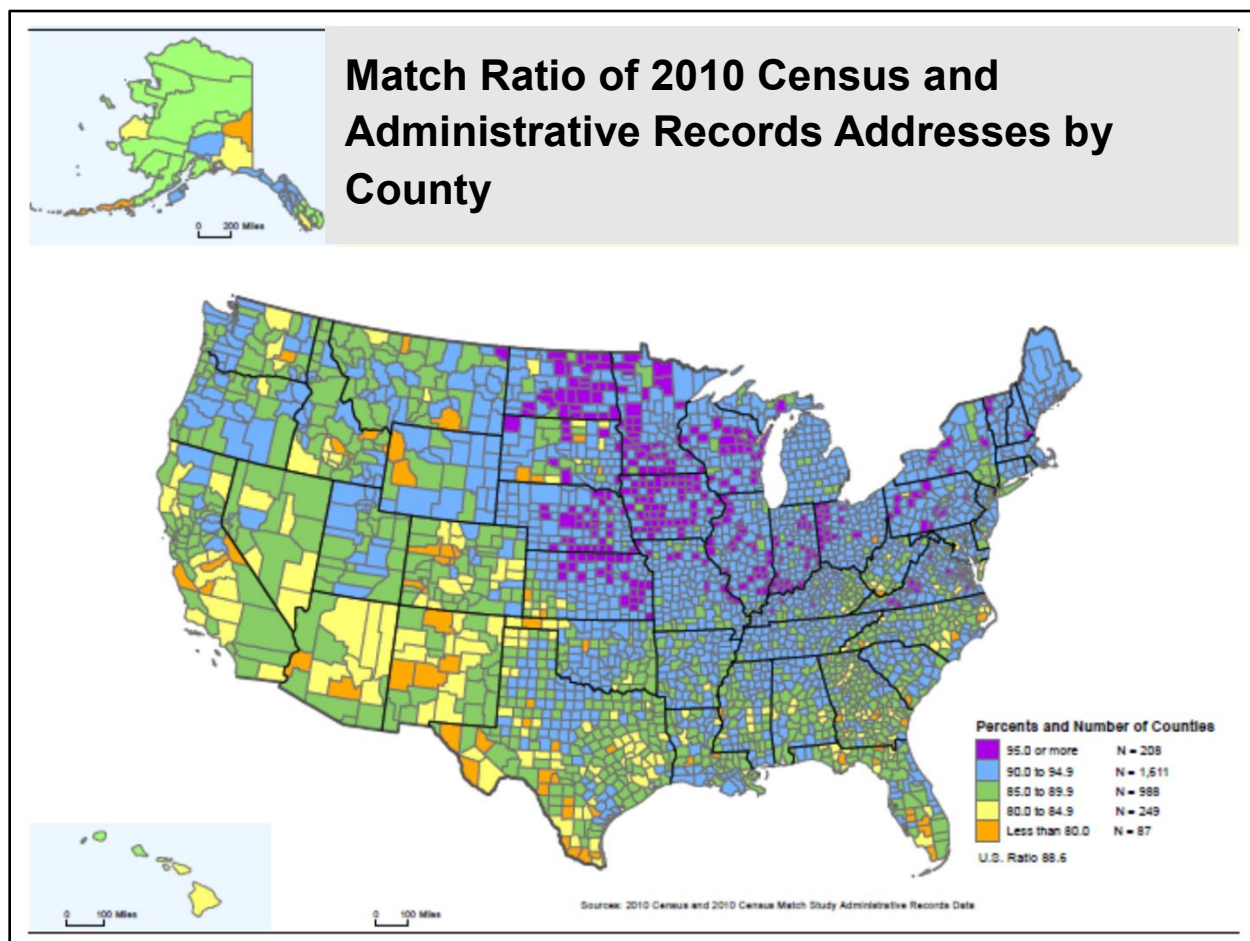
In addition to the third-party address and street centerline data the Census Bureau acquired for the 2020 Census, the Census Bureau will continue to acquire administrative records and third-party data through efforts that are coordinated through the Center for Administrative Records Research and Applications (CARRA).

CARRA has created an administrative records composite file from the following federal data sources:

- Housing and Urban Development (HUD) Public and Indian Housing Center Database.
- HUD Tenant Rental Assistance Certification System Database.
- Indian Health Service Patient Registration File.
- Selective Service System Registration File.

- Centers for Medicare and Medicaid Services, Medicare Enrollment Database.

In addition to these federal files, CARRA has acquired several third-party data files. As a first validation exercise, this composite was matched to the final 2010 Census address list. Results, shown in Figure 4, indicate high match rates in urban areas. The overall match ratio was 92.6 percent, and the majority of counties had a match ratio of 85.0 percent or higher. The CARRA data (made available through the Census PEARSIS system) will be used as a part of the LUCA Address Validation process.



Source: Linking Administrative Records at the U.S. Census Bureau Presentation (CARRA, June 2015)

Figure 4: Match Ratio of 2010 Census and Administrative Records Addresses

2.6.2.3 Group Quarters Administrative Records Partnerships

The Address Canvassing operation for the 2020 Census will collect data for GQs to support GQ enumeration activities. In addition to the traditional address and location information, these enumeration activities require information about the type of GQ and contact information for GQ management. In-Field Address Canvassing will collect these additional data when possible.

However, the U.S. Census Bureau is implementing new and improved methods to update the GQ frame. Addresses of Group Quarters and Transitory Locations will be validated using In-Office Address Canvassing Group Quarters/Transitory Locations, which began production in fall of 2017. This process is detailed in Section 3.

2.6.2.4 Expanded Postal Service Updates and Services

The Census Bureau has broadened the scope of USPS-related updates prior to the 2020 Census. Goals of this work have been to expand the universe of deliverable addresses into Puerto Rico and to assess the mailability of all addresses in the MAF/TIGER System.

Mailability Confirmation

The mailability of an address is a key factor in determining how to approach the census enumeration for that address. Ideally, the Census Bureau would like to be able to notify most respondents of their response options by mail. To support that effort, the Census Bureau employed methods to assess and improve the mailability of addresses in the MAF/TIGER System. The Census Bureau used USPS's Coding Accuracy Support System (CASS) service to evaluate the quality of the address-matching software using addresses not found on the DSF in order to improve the accuracy of ZIP+4, carrier route, and five-digit coding. This process will help inform strategies for contacting respondents at the time of census enumeration.

Puerto Rico DSF Updates

Although the DSF includes all of the USPS's deliverable addresses in Puerto Rico, the Census Bureau did not include these addresses in the MAF/TIGER System in the past. This was primarily because of limitations in matching Puerto Rico style addresses to each other. The GSS research included the identification of methods to standardize Puerto Rico style addresses and to improve the address matching beyond identification of only exact text strings. This allowed the MAF/TIGER System update process to closely resemble the stateside method and include regular DSF updates in Puerto Rico. These updates could enable the future Census operations to employ a mailout self-response strategy in some areas of Puerto Rico. The Puerto Rico DSF updates started with the spring 2016 DSF Refresh.

DSF Reliability Index

The DSF Reliability Index will supplement the DSF Stability Index in decision-making for Address Canvassing. The DSF Reliability Index identifies blocks where the DSF is a reliable source for the housing universe. The DSF Reliability Index is calculated for census tabulation blocks by tracing the original source that added each housing unit to the MAF and the first DSF vintage for each unit that passes the decennial filter within the block. A unit that was originally added to the MAF by the DSF or was present on the DSF within one year of being originally added by some other source (e.g., Address Canvassing, GSS partner file acquisitions) is considered a DSF Reliable housing unit. Index values range from zero to one; an index value of one indicates that each housing unit in the given block is DSF Reliable. The higher the index

value, the greater the confidence that the DSF would capture coverage changes within the given block and reduce the need for In-Field Address Canvassing.

2.6.2.5 MAF Unduplication

In addition to efforts to add new or missing addresses to the MAF, the Census Bureau planned to identify duplicate MAF addresses as a separate In-Office Address Canvassing process. MAF Unduplication is now part of the GSS effort. Linkages of MAF duplicate records ensure that only one instance of the address is included on the census address list and maintain different variations of addresses for the purpose of future matching operations. Address list overcoverage at the time of enumeration could cause confusion and would be more costly to resolve.

During August and September 2017, the Census Bureau conducted an automated match with clerical follow-up in order to identify and resolve duplicates in the MAF. Enhanced software identified potential unlinked duplicate city-style addresses in the MAF using exact and equivocated address matching methods. The process not only identified duplicate pairs, but also clusters of addresses that appeared duplicative based on address information. Census Bureau staff clerically reviewed the matching results to ensure that the addresses identified as duplicates did indeed reflect the same structure on the ground. The staff confirmed that the automated process of identifying duplicates was effective and identified common characteristics of duplicate pairs (or clusters) and categorized them accordingly. The clerical review staff then used the categorical information to inform an automated resolution strategy; categories of the duplicate pairs (or clusters) that were valid were linked via software specifically designed for the task. This process was designed to minimize the risk of potential MAF undercoverage due to the over-identification of duplicate addresses.

2.6.2.6 Address Canvassing Updates

As previously discussed, the Address Canvassing operation has three component parts that, with integrated QC, all work together to assure an accurate census list for census enumeration. Detailed descriptions of all of the components are provided in the sections listed below.

- In-Office Address Canvassing (*Section 3*).
- MAF Coverage Study (*Section 4*).
- In-Field Address Canvassing (*Section 5*).

In fall of 2019, once the Address Canvassing operation is complete, the Census Bureau will create the initial address list for the 2020 Census. That list will be used to mail out invitations that inform respondents of their census response options or questionnaires. This list will also be the dependent list for the census enumeration operations.

2.6.2.7 Enumeration Updates

Geographic areas included in the census field enumeration operations may be reviewed during In-Office Address Canvassing. However, they will not be visited during In-Field Address Canvassing. These operations include Update Leave, Update Enumerate, and Remote Alaska, which is a suboperation of Update Enumerate.

Update Leave

Update Leave enumerators will canvass the geographic area, update the address list and feature data, and leave a Census Choice Questionnaire package for housing unit residents. This package allows residents to have an opportunity to self-respond by mailing back the questionnaire or by using an online form. The questionnaire contains an ID that the enumerator associates to an address so that it is linked to the housing unit and the self-response can be matched back to the address.

Update Enumerate

UE enumerators will canvass the geographic area, update the address list and census maps, and conduct interviews for each housing unit using paper questionnaires.

Remote Alaska

Remote Alaska (RA) areas primarily consist of Alaska native villages in sparsely populated areas of Alaska. These areas have unique challenges associated with the accessibility to communities where the population ranges from several hundred people to just a few people. Communities are widely scattered and rarely linked by roads. Most are accessible only by small-engine airplane, snowmobile, four-wheel-drive vehicles, dogsled, or some combination thereof. This operation occurs earlier than other enumeration operations due to seasonal availability of the population, who disperse when warmer weather arrives. The enumerators canvass the geographic areas, update the address list and census maps, and conduct interviews for each housing unit using paper questionnaires.

3 In-Office Address Canvassing [ADC 8-1]

This section describes the details of how In-Office Address Canvassing [ADC 8-1] will be conducted for the 2020 Census. An overview of the activity is presented, followed by detailed process descriptions using Business Process Model and Notation (BPMN) to depict the steps in the activity and the key information flows. Refer to the Activity Tree in Appendix C for a list of all of the major operational activities and subactivities associated with the ADC operation.

3.1 Design Overview

The In-Office Address Canvassing operational activity [ADC 8-1] is a continuous process of monitoring the residential and nonresidential landscape to measure, assess, and ensure the completeness and accuracy of the MAF and associated attributes and geospatial data.

The ultimate goals of the In-Office Address Canvassing are to:

- Identify geographic areas that are stable and do not require address or geospatial updates.
- Update some address and spatial data for living quarters (housing units, GQs, and TLs) in geographic areas through In-Office Address Canvassing processes.
- Identify geographic areas that will require In-Field Address Canvassing prior to the census enumeration.

The In-Office Address Canvassing efforts prioritize areas of the country where the Census Bureau plans for a self-response enumeration strategy. The addresses in these areas (classified as TEA-1 for enumeration) are primarily city-style and mailable formats. Census Bureau research through the GSS efforts, the 2014 Address Validation Test, the MAF Coverage Study, the Address Canvassing Test, and the Address Canvassing operation of the 2018 End-to-End Census Test has shown that In-Office updates are possible in these areas.

Since the December 2015 release of the first Detailed Operational Plan for Address Canvassing, the Census Bureau has made some changes to the Address Canvassing operational design that have resulted in a revised estimate of the number of addresses to be prepared without In-Field Address Canvassing. With the discontinuation in 2017 of some of the original component activities—including the ABR project in February 2017 and the MAF Coverage Study in April 2017—it is now expected that 30 percent of self-response addresses will require In-Field Address Canvassing, as opposed to the 25 percent estimate given in 2015.

In-Office Address Canvassing is not a single, discrete event occurring at a specific time. In the grand view of the process, the work of the GSS to update the MAF/TIGER System with partner data is part of the In-Office work to update the frame. However, this section only describes the activities developed that work to methodically review the nation through In-Office methods.

These additional processes will integrate with the GSS efforts to provide complete address coverage for the majority of the country.

3.2 Detailed Process Description

Figure 5 is a top-level Business Process Model (BPM) showing the Level 1 activity areas within the ADC operation. BPMs for the 2020 Census follow industry-standard Business Process Model and Notation (BPMN). An explanation of how to read the BPMN notations and a full sized copy of all of the BPMN diagrams for this operation are provided under a separate cover.

This top-level BPM serves as the Context Model for the ADC operation. A BPMN Context Model displays the high-level activities within the operation and relationships between them, whereas the IDEF0 Context Diagram shown earlier depicts the boundaries of the operation or activity and the interfaces between the operation or activity and other operations and activities with which it is associated.

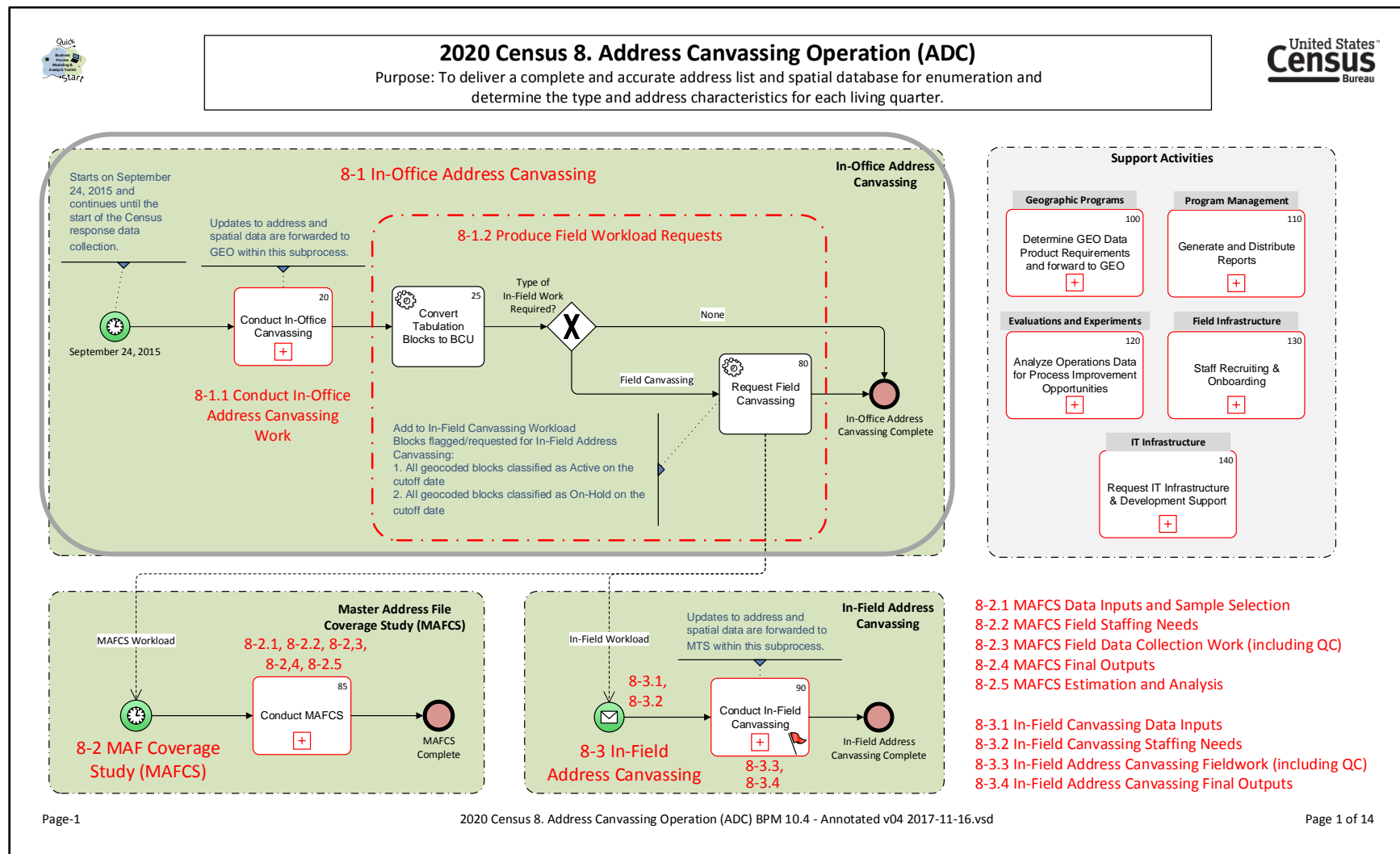


Figure 5: In-Office Address Canvassing [ADC 8-1] within Top-Level ADC Context Model

The In-Office Address Canvassing Operational Activity [ADC 8-1] is subdivided into the following Activity Areas.

- In-Office Address Canvassing [ADC 8-1.1].
- Fieldwork Requests [ADC 8-1.2].

Subsequent sections describe the In-Office Address Canvassing operational activity in detail.

3.2.1 Conduct In-Office Address Canvassing Work [ADC 8-1.1]

Figure 6 shows the BPM for the Conduct In-Office Address Canvassing Work [ADC 8-1.1] activity area (area within the gray rounded rectangle) and its constituent activities within the overall context of the ADC operation.

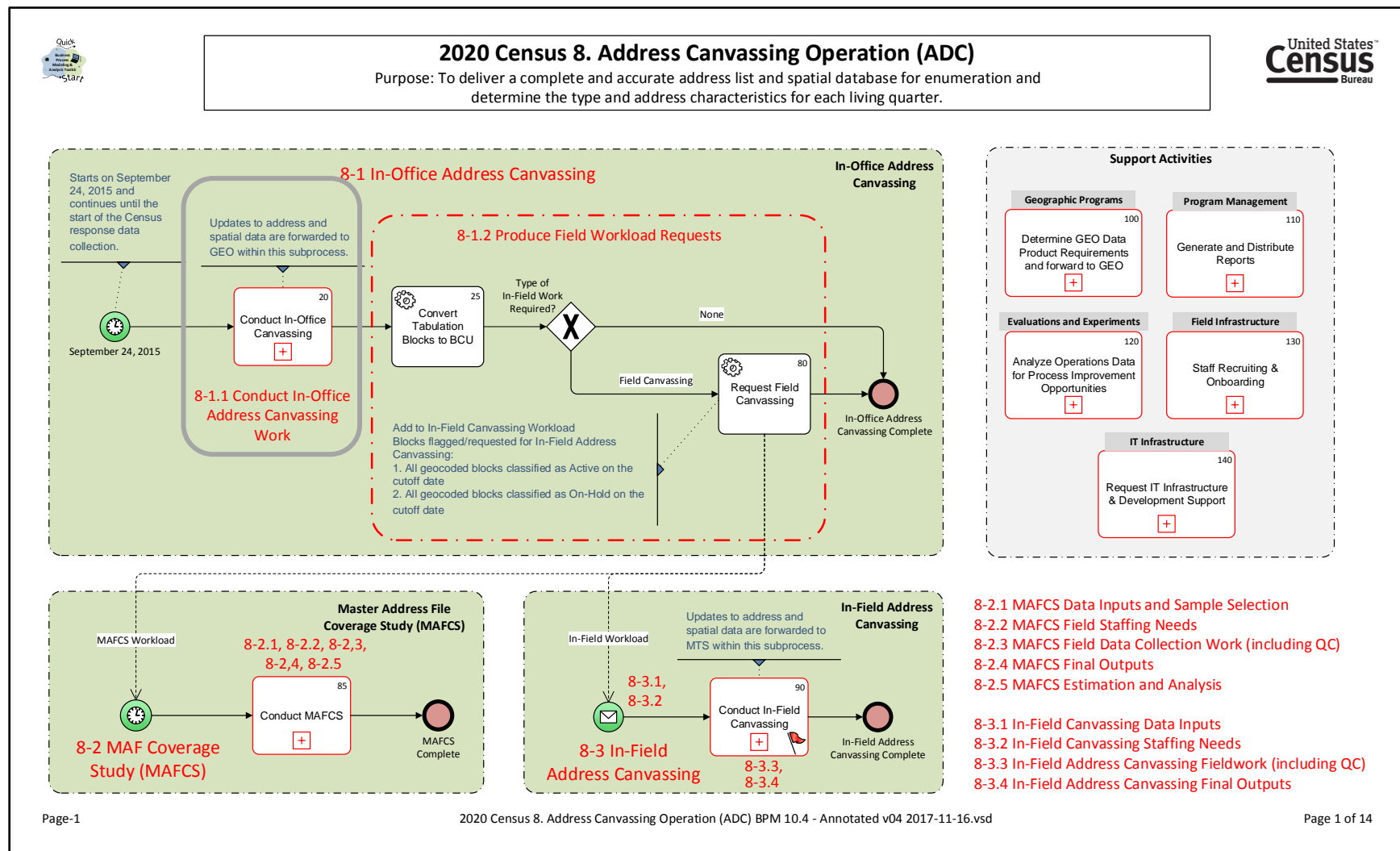


Figure 6: Conduct In-Office Address Canvassing Work [ADC 8-1.1] Constituent Activities

The “Conduct In-Office Address Canvassing Work” operational subactivity is subdivided into the following Activity Areas.

- Conduct In-Office Address Canvassing Work [ADC 8-1.1].
 - In-Office Address Canvassing Universe Creation [ADC 8-1.1.1].
 - Interactive Review (IR) [ADC 8-1.1.2].
 - Active Block Resolution (ABR) [ADC 8-1.1.3].
 - Change Monitoring (Triggers) [ADC 8-1.1.4].
 - In-Field Canvassing Decision [ADC 8-1.1.5].
 - Ungeocoded Resolution (UR) [ADC 8-1.1.6].
 - In-Office Address Canvassing Group Quarters/Transitory Locations [ADC 8-1.1.7].
 - LUCA Address Validation [ADC 8-1.1.8].

A detailed view of the constituent activities that make up the “Conduct In-Office Address Canvassing Work” operational subactivity is given in [Figure 7](#) below.



3.2.1.1 In-Office Address Canvassing Universe Creation [ADC 8-1.1.1]

Refer to Figure 7 for a view of the activity that makes up the “In-Office Address Canvassing Universe Creation” operational subactivity. GEO establishes the universe for the In-Office Address Canvassing work by first creating the Block Tracking Database (BTD), a file of all blocks in the United States and Puerto Rico. GEO then identifies blocks that are eligible for review.

Block Tracking Database

The BTD is a complete inventory of all blocks (approximately 11 million tabulation blocks) in MAF/TIGER. The BTD contains the associated MAF/TIGER System summary information that is required to inform and manage the In-Office Address Canvassing workload and In-Field Address Canvassing workload. Each block in the BTD has a status (such as growth, decline, overcoverage, and undercoverage; as well as missing roads, misaligned roads, and areas of future growth) that allows the 2020 Census to make final decisions regarding the universe for In-Field Address Canvassing. The BTD is an input to the BARCA system. It also retains block trigger data and block level outputs from the IR and ABR processes.

Identify Blocks Permanently without Population and Housing

Specific portions of the nation are permanently without population and living quarters because of the physical characteristics of the area and the census block geography. For example, territorial waters in the Atlantic, Pacific, and Arctic oceans, Gulf of Mexico, Bering Sea, and inland water in the Great Lakes are defined as separate census blocks in the MAF/TIGER System consisting entirely of water and lacking any population and living quarters. This category of areas also includes highway medians, traffic islands, and other small areas that, for various reasons, met the criteria to be defined as separate census blocks, but are either too small to contain living quarters or are areas in which living quarters are not permitted (for example, an interstate highway median).

The blocks within these areas undergo an automated review, instead of an interactive review. Those blocks that correctly contain no housing units are given a Passive status. Those blocks that incorrectly contain housing units are given an Active status, as they require updates.

3.2.1.2 Interactive Review (IR) [ADC 8-1.1.2]

The IR operational subactivity is subdivided into the following constituent activities.

- Interactive Review (IR) [ADC 8-1.1.2]
 - Prioritizing the IR Work [ADC 8-1.1.2.1]
 - Managing the IR Work [ADC 8-1.1.2.2]
 - Performing the IR Work [ADC 8-1.1.2.3]
 - IR Quality Control [ADC 8-1.1.2.4]
 - IR Outputs [ADC 8-1.1.2.5]

A detailed view of the constituent activities that make up the IR operational subactivity is given in Figure 8 below.

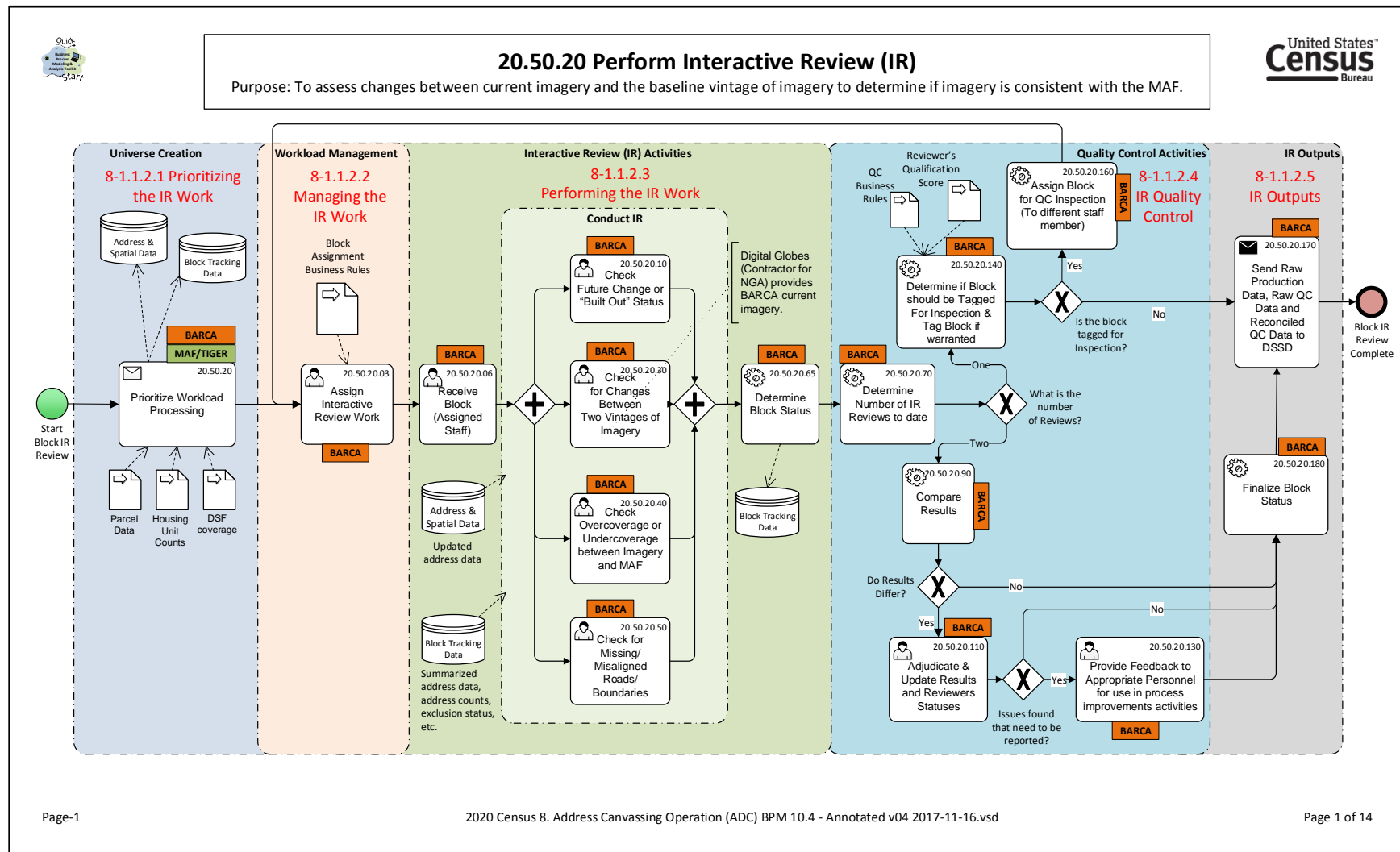


Figure 8: Interactive Review (IR)

The first component of In-Office Address Canvassing is IR, which is an imagery-based review to assess changes between current imagery and the baseline vintage of imagery, and to assess the extent to which the number of units in the MAF is consistent with the number of units visible in the current imagery. The IR production work started in September 2015.

Subsequent sections describe the IR operational subactivity in detail.

Prioritizing the IR Work [ADC 8-1.1.2.1]

Refer to [Figure 8](#) for a view of the activity that makes up the “Prioritizing the IR Work” operational subactivity.

The BARCA system, supported by the BTD, is the mechanism for assigning work to the NPC staff. Each IR work assignment contains multiple blocks grouped within a census tabulation tract, referred to as a block cluster.

The block cluster assignments are queued in the BARCA in priority order influenced by Assignment Business Rules, which take into account some of the following factors:

- Availability of parcel boundary data (used early in the IR process).

The BARCA displays parcel boundary data from local governments or third-party data vendors when available. In most instances, this information is helpful to understanding property boundaries, residential/commercial zones, and sometimes addressing. Given its usefulness, areas known to have these data available were initially prioritized.

- Test and analysis areas.

Areas covered by test and study areas, including the Address Canvassing Test, the 2016 MAFCS, and the 2018 End-to-End Census Test, were prioritized for work to ensure test and analysis needs were met.

- Trigger/re-review criteria.

Triggers for re-review include a variety of factors, including updated imagery and changes to block status.

After all blocks were reviewed at least once and field tests and studies were completed, blocks are prioritized based on triggers.

Managing the IR Work [ADC 8-1.1.2.2]

Refer to [Figure 8](#) for a view of the activity that makes up the “Managing the IR Work” operational subactivity.

The BARCA queues the work assignments per the prioritization criteria. Clerks are automatically assigned the next available block cluster from the prioritized queue. Once the clerk completes an assignment, they select a new one from the top of the queue.

There are two types of work assignments: production and QC. The QC clerk's activity is the same as the production clerk. However, the BARCA ensures that QC clerk and the production clerk are different reviewers. Once the block completes the production and QC process, the BARCA compares the results from both clerks. An NPC clerk conducts the adjudication if the results do not match.

Performing the IR Work [ADC 8-1.1.2.3]

Refer to [Figure 8](#) for a view of the activity that makes up the “Performing the IR Work” operational subactivity.

Once the IR clerk selects their block cluster assignment from the top of the queue, they will work each block within the cluster in sequence, one at a time. The details of the work process are provided below.

Block Information

The clerk selects and opens one of the assigned blocks for work. Clerks have the following information for each block at their disposal:

- Baseline imagery (2009 imagery from the time of Address Canvassing operation for the 2010 Census).
- Current imagery (less than one year old).
- Map Spot locations for each census address (when available).
- The number of addresses in the block.
- The number of address in the block with map spots.
- The housing unit type make-up of the block (e.g. single family, multi-unit, and trailer information).
- TIGER road features.
- Public lands data.
- A grid pattern overlay to help focus work (in large blocks only).
- Parcel boundary data (where available).

The clerk conducts all of the activities described below for each block in the assignment, but not necessarily in the same order. The clerk first uses a tool to swipe between the old and current

images and looks for changes that will indicate how they proceed through the following activities.

Imagery Comparison (baseline compared to current imagery)

By comparing the baseline block image and current block image, a clerk identifies any changes in the housing inventory and records observed differences in BARCA. The clerk assigns pins to the current image to indicate areas of growth or decline. The pin assigned by the clerk includes information about whether the growth is past or present growth (change in the number of rooftops), future growth (signs of construction), or both. Pin color represents growth or decline and pin size indicates the level of magnitude of the growth or decline on a three-point scale.

Built Out or Future Growth Status (current imagery)

By assessing the current image and spatial parcel boundary data, the clerk determines if the entire land area of the block is built out. The built-out status can represent either of the following:

- Built out: The block land area is completely covered by structures and there is no space to build additional structures.
- Non-developable: The block consists completely of nonresidential land use and is unlikely to change (e.g., a public park).

The clerk also reviews the current imagery and determines if there are signs of possible future residential growth (for example, cleared land area). A block can either be built out or have signs of future growth, but not both. However, a block could display neither status; that is, the block is not built out, but there is no indication of future growth.

Missing or Misaligned Feature Review (current imagery compared to TIGER)

By comparing the MAF/TIGER database road and block boundary features against the current imagery, the clerk identifies and records the appearance of any missing road features or misaligned road and boundary features. Any such case is recorded by dropping a “Missing Feature” or “Misaligned Feature/Boundary” pin on the map to identify the location of the discrepancy in BARCA.

Imagery to MAF Coverage Review (current imagery compared MAF)

By assessing the current imagery, the clerk ascertains the approximate number of units, both residential and nonresidential. The clerk then compares the determined number of units in imagery to the count of units in the MAF. To complete this activity, BARCA presents valid MAF residential and nonresidential unit counts as well as their associated map spots. The clerk identifies whether the MAF has more addresses than the imagery (overcoverage) or the imagery

has more addresses than the MAF (undercoverage) and drops the respective pin on the map. The pin color and size indicate the type and magnitude of the coverage difference.

Special Procedure for Large Blocks

In large (physical area) blocks, staff use a grid to assist in their work, moving methodically throughout the block grid square by grid square.

Complete Block Work

When the IR clerk completes a block, they mark it as completed and then review the next block in their assignment. A block may have multiple areas of growth and/or decline. The BARCA aggregates the information for growth and decline separately to determine and assign an overall block status. While ABR was in progress, Active blocks were sent to the ABR component of In-Office Address Canvassing as described below. After the suspension of ABR, Active blocks are either subject to re-review by IR or other In-Office Address Canvassing processes, or become part of the In-Field Address Canvassing workload.

IR Quality Control [ADC 8-1.1.2.4]

Refer to [Figure 8](#) for a view of the activity that makes up the “IR Quality Control” operational subactivity.

The IR QC procedure involves checking the quality of each clerk’s work at a high rate to start, and then adjusting the QC sample based on their individual work and acceptable error thresholds. When a clerk finishes the IR activities for a block, the BARCA determines whether a particular block requires a QC inspection, per the business rules. Another clerk conducts the QC inspection and then an expert adjudicates the two results if they do not match.

QC Business Rules (Inspection Rate Business Rules)

2016-2018 Process

A clerk’s first set of completed blocks are tagged for QC inspection at a rate of 100 percent. This 100 percent inspection lasts for the first 500 blocks, called the baseline. Once the clerk establishes a baseline, the error rate for the blocks in the clerk’s baseline group is compared to the targeted error rate, currently five percent. If the clerk’s error rate is lower than the targeted level, future inspections are conducted based on a sample of the clerk’s work. If the clerk’s error rate is too high, the clerk receives feedback and the 100 percent inspection resumes. After each subsequent inspection, the clerk’s error rates are compared again and the inspection sample rate is reset when necessary. The BARCA system implements these business rules and selects blocks for inspection, as appropriate.

The targeted error rate was set with considerations for both cost and quality given an expected production error rate. The initial production error rate was thought to be about 7.5 percent, based on expert opinion. As of October 2017, the project had an overall error rate of under 5 percent.

As production continues, QC business rules can be adjusted with considerations for both cost and quality.

2018-2019 Process

As of October 2017, revisions to the business rules are in development and are expected to be implemented in BARCA by the end of March 2018.

The revised QC sampling plan consists of three levels of inspection defined by the rate at which blocks are inspected. A clerk will move among the levels of inspection as appropriate based on their error rate. The error rate of each clerk will be computed based on the set of blocks that were most recently selected for inspection.

A clerk who is new to IR, or a clerk who performs poorly, will have all of their completed blocks inspected. A clerk who performs very well will have a low inspection rate, saving time and money, while a clerk who performs at a moderate level will be reviewed more frequently than a clerk in the low inspection rate category.

The error rate for each clerk is the number of blocks in error divided by the number of blocks that have completed inspection, adjudication, and appeal. Only the most recent blocks inspected for each clerk will be included in the calculation, and the number of blocks to use in the error rate will vary based on the clerk's current inspection category.

Inspection

If it is the first IR work for the block, the Quality Control business rules described above determine if the block should be tagged for inspection. If the block is tagged for inspection, it is assigned to a different clerk (at the same skill level) to perform the IR activities again. There is no information on the case to indicate to the second clerk that the first clerk also worked the block. The review is independent. If the block is not tagged for inspection, a second clerk does not work the block. IR activities are complete for the block and the final block outcome is determined by the first clerk's review.

Adjudication

Once the inspection clerk has completed the second IR for the block, an automated match compares the results of the first and second reviews. If the results match, IR is complete and the status of the block is determined. If there is a critical difference in the results from the two independent procedures, the result is referred for adjudication to an expert (e.g., a subject matter expert or geographer). The expert determines the correct results and assigns error codes to one clerk's block or both.

The expert then provides feedback that supervisors or procedure designers can use to promote continuous improvement. If the expert review calls any prior uninspected block into question, they can identify and submit that block, belatedly, to inspection. IR is complete for the block at this stage, and the status of the block is determined.

IR Outputs [ADC 8-1.1.2.5]

Refer to [Figure 8](#) for a view of the activity that makes up the “IR Outputs” operational subactivity.

Block Status

The results of the IR determine the block status that is stored in the BTD. Clerks may assign more than one pin to a block indicating that more In-Office Address Canvassing work is required in the block. The BARCA aggregates the outcomes assigned by the clerk for each block. Considering only the imagery review and the imagery to MAF coverage review, there are four possible summary level outcomes:

Table 8: Imagery Review Outcomes

Imagery Review	State of the MAF
No change	Consistent with imagery
No change	Inconsistent with imagery
Change	Consistent with imagery
Change	Inconsistent with imagery

This information, in combination with the outcomes from the misaligned feature and built-out or future growth review, determines the subsequent activities required for the block. The BARCA assigns each block a status of either Passive, Active, or On Hold as described below.

- ***Passive Blocks***

A Passive block has no indication of coverage concerns (or potential future coverage concerns) from any activities in the IR. That is, the IR indicated either no change or change, but the MAF/TIGER System is consistent with imagery, and the block has no signs of future growth. Hence, no reason exists for further In-Office or In-Field Address Canvassing work. Geography Division processes will continuously monitor the block for trigger events (e.g., housing unit estimates indicate growth) that indicate it may need to reenter the IR. See Section 3.2.1.4 for a description of the change monitoring processes.

- ***Active Blocks***

An Active block has some indication of coverage differences identified during any phase of the IR. That is, the IR staff set one or more pins during their review to indicate that the MAF/TIGER System data are inconsistent with imagery. Therefore, the block requires further assessment to either fix the coverage concerns with a MAF/TIGER System update or assign the block to In-Field Address Canvassing.

- ***On Hold Blocks***

In some instances, the IR clerk may observe ongoing and future growth in imagery or may find that there are problems with imagery that make determinations about change impossible (e.g., obstructions in the imagery or low-resolution imagery). In those cases, the block will be placed On Hold awaiting new imagery. If the imagery becomes available before a cutoff date, the block reenters IR. If the imagery does not become available before the cutoff date, the block is assigned to In-Field Address Canvassing.

Production Reports

As the IR clerks complete their work assignments, the BARCA tracks the amount of time spent on a particular assignment. This information, in combination with the number of completed assignments and other paradata help to determine production and completion rates. These rates populate daily production reports for NPC and Headquarters management.

3.2.1.3 Active Block Resolution (ABR) [ADC 8-1.1.3]

The ABR component was in place between April 2016 and February of 2017, when it was discontinued.

The ABR operational subactivity is subdivided into the following Activity Areas.

- Active Block Resolution (ABR) [ADC 8-1.1.3].
 - Prioritizing the ABR Work [ADC 8-1.1.3.1].
 - Managing the ABR Work [ADC 8-1.1.3.2].
 - Performing the ABR Work [ADC 8-1.1.3.3].
 - ABR Quality Control [ADC 8-1.1.3.4].
 - ABR Outputs [ADC 8-1.1.3.5].

A detailed view of the constituent activities that make up the ABR operational subactivity is given in Figure 9 below.

While the ABR was in progress, ABR received the Active blocks identified during IR. ABR staff attempted to resolve coverage concerns identified during IR and verify every MAF unit in the Active block by virtually canvassing the entire block. During the virtual canvass, ABR staff compared what was found in imagery to MAF/TIGER System data and external data sources to attempt to resolve pins assigned in IR and complete a ground-to-book canvass. As staff canvassed the block, they made updates within the GATRES software to resolve pins and take action on each address in the block. If the ABR staff could not resolve the problem in the office, they indicated that the block was unresolved or partially resolved in the BARCA, and the block became a candidate for In-Field Address Canvassing.

The ABR staff conducted a variety of activities in order to virtually canvass the Active block so that the In-Office Address Canvassing actions were comparable to those performed during the In-Field Address Canvassing. These activities include are described in detail in the sections below.

Subsequent sections describe the ABR operational subactivity in detail.

Prioritizing the ABR Work [ADC 8-1.1.3.1]

Refer to [Figure 9](#) for a view of the activity that makes up the “Prioritizing the ABR Work” operational subactivity.

ABR work was prioritized primarily based on data within the BTD. While ABR was active, work was initially prioritized to complete review of test sites, including the Address Canvassing Test, MAFCS sample blocks, and the 2018 End-to-End Census Test sites.

Managing the ABR Work [ADC 8-1.1.3.2]

Refer to [Figure 9](#) for a view of the activity that makes up the “Managing the ABR Work” operational subactivity.

The BARCA system, supported by the BTD, was the mechanism for assigning work to the ABR staff. Each ABR work assignment consisted of one block. The blocks were clustered within a specified higher-level geography, such as state and county.

Create Business Rules for ABR versus In-Field Eligibility

ABR originally planned to review all Active blocks from the IR process. After ABR commenced and the Census Bureau refined In-Office Address Canvassing procedures with actual production rates, program managers planned to investigate whether some Active blocks could be flagged for In-Field Address Canvassing without an additional review. The Census Bureau had determined that a time threshold set for resolving blocks in the office would mirror the IR cutoff date in 2019.

Prioritize Work Assignments

The block assignments were queued in the BARCA in priority order, influenced by some of the following factors (in no particular order):

- IR Outcomes.

The nature of some of the IR Active block outcomes is such that there were varying levels of complexity in the blocks sent to ABR, and as a result the amount of time required to perform the ABR varied. This information could be used to prioritize more difficult assignments, or to identify assignments that could be finished quickly.

- Availability of local GIS data and the ASE status.

The ABR staff relied on the availability of local source data in order to accurately resolve the coverage concern and update the MAF. The BTD and BARCA systems were integrated with information from the GSS Workflow Information Control System to provide ABR staff information of interest as it related to the block, including:

- Details about local GIS data acquired through GSS or other third-party data.
- GSS local file processing status.
- Identification of where a local file is not on-hand.

ABR work assignments were prioritized within this category based on the order above. Blocks in category 3 prompted communication to the GSS program, which would initiate an attempt to acquire local partner files for the area. Note that this process was envisioned as an automated determination; however, it was not implemented in the initial stages of ABR production.

- Blocks Released from an “On Hold” status

Some blocks may have received an “On Hold” status during the first ABR review. In those cases, an automated system detects when the event that the block is being held for

(e.g. a file acquisition or MAF update process) occurs. The block would then return to the ABR workload and be assigned to the original ABR staff if they are available.

Assign the Work

ABR staff selected their own assignment within BARCA from a specified higher-level geography, such as county or state. Where possible, ABR staff worked all of the blocks nominated for ABR within a county. Limiting the focus of one person's review to specific geography enabled them to resolve problems that persisted across blocks in an area and to build expertise in the available source files for the area.

Production Reports

As the ABR staff completed each work assignment, they recorded the amount of time spent on a particular assignment. This information, in combination with the number of completed assignments, helped to determine production and completion rates. These rates populated production reports for headquarters management.

Performing the ABR Work [ADC 8-1.1.3.3]

Refer to [Figure 9](#) for a view of the activity that makes up the "Performing the ABR Work" operational subactivity.

Once the ABR staff member selected their block assignment from the BARCA assignment queue, they conducted a series of tasks described below to complete their work. A block may have had a single issue or multiple issues, as identified by pins assigned by the IR clerk. Blocks in ABR were virtually canvassed, regardless of the number of pins identified in IR.

Possible issues eligible for ABR included:

- Growth seen in imagery.
- Decline seen in imagery.
- Undercoverage based on the comparison of the census address list count with imagery.
- Overcoverage based on comparison of the census address list count with imagery.
- Missing road feature.
- Misaligned road or boundary feature.

The BARCA displayed each issue, as identified by the IR clerk, with a unique pin within the BARCA. The ABR staff canvassed the entire block by choosing a starting point and then working systematically to canvass the block as they would if they were in the field. While

performing the virtual canvass, the ABR staff worked each issue, or pin, at a time within the block and assigned a resolution status code in the BARCA for each.

Resources

In addition to the information retained in the BARCA, the ABR staff used the following systems and data to conduct ABR:

Applications and systems:

- GATRES: The primary application used to access and update live TIGER and record address updates.
- MAF Browser: Used by QC reviewers to access live MAF.
- BARCA: Used to review the pins place within the IR, and to control assignments.
- BTD: Reflects the overall result of ABR.
- GSS Workflow Control System (GWCS): Used to review availability and status of GSS partner file acquisition and processing.

Data and/or information used in ABR:

- The list of valid census addresses contained in the MAF for the block: Used as the baseline for the block, the list that will be added to, deleted from, and/or corrected during the “virtual” canvass.
- Where available, GSS partner data: Used as a resource to identify and validate addresses being added or corrected within the ABR.
- Local GIS resources for the area available online: Used as a resource to identify and validate addresses being added or corrected within the ABR.
- Ungeocoded records for the area (assigned via the block’s ZIP Code information): Used to identify addresses that appeared to be missing from the block because of a lack of geocode. As part of ABR, staff attempted to geocode these records in order to fix coverage concerns. These recorded are now processed by the UR component of In-Office Address Canvassing.
- Web-based mapping utilities with street level imagery to conduct research (for example Google, Zillow etc.): Used as a resource to validate address source information for addresses being added or corrected within the ABR.

- Where available, the address lists from the Census Bureau’s commercial address list acquisition: Used as a resource to identify and validate addresses being added or corrected within the ABR.

Assess the Overall Results of the IR

First, the ABR staff needed to ensure that the IR information was still valid. In some cases, ABR staff found that the IR result was inaccurate because recent MAF/TIGER System updates had already resolved the issues. In rare circumstances there was an error made in IR. In this case, they assigned the appropriate resolution status to all issue pins in the block.

Gather Data Sources and Conduct Research

After reviewing the overall block status, the ABR staff gathered all available data for the block and conducted a review of that data to determine if each pin in the BARCA was resolvable with the available information. The staff then reviewed their list of local data sources and searched for any new, online sources. If data existed that would immediately resolve any of the pins, the staff recorded these sources in their reference list and then proceeded to make the necessary updates.

Virtually Canvass the Block to Update/Validate Address List and Maps

The ABR staff used a methodical approach to assess each pin in the block, while systematically evaluating each address in the block in a “virtual” canvass of the block. Some pins required updates to the MAF/TIGER System. If the ABR staff determined updates were required, they used the GATRES tool to enter the appropriate information. Activities within GATRES to resolve issues included reshaping features, adding or moving map spots, and updating the address list. The feature updates were made to the live TIGER database, meaning that the ABR staff updated the source file directly via the GATRES tool. The address updates were collected in GATRES, but the MAF update occurred later.

The ABR staff validated all of the addresses in the block. These address updates included:

- Confirming that the address data that appeared in imagery were also in the MAF.
- Updating existing MAF addresses to assure that they reflected what existed in the source data, as appropriate.
- Adding addresses that appeared to be included in imagery but were missing in the MAF, as confirmed by local sources.
- Indicating when existing MAF addresses no longer represented housing units, as confirmed by local sources.

- Deleting addresses that appeared in the Active block inventory that appeared to be duplicates of other addresses in the Active block.
- Deleting addresses that did not appear to belong in the Active block and their specific location could not be confirmed by local data sources to be within the Active block.
- Adding new, suspected GQ addresses for input into the In-Office Address Canvassing GQ/TL.
- Adding road features and reshaping misaligned roads where they impacted housing units.
- Adding road features to resolve ungeocoded addresses and/or updating geocodes for ungeocoded or misgeocoded MAF addresses, thereby including them in the inventory of addresses for the Active block.

As part of the ABR process, ABR staff could resolve ungeocoded records using methods similar to the UR component activity. The ABR staff also assigned a verification status to the ungeocoded address in these cases. A feature correction alone would enable the address to geocode during the next DSF Refresh. However, the additional verification ensured that the record received an In-Office Address Canvassing source in the MAF.

The ABR planning process was improved between 2016 and 2017 to include a procedure to review only portions of blocks that were identified as Active, or indicating change. This is known as a “pin-based” approach, based on the use of different type of graphical pins used to mark change areas during the IR process. A portion of these blocks could be subject to rework. The ABR project was discontinued in February 2017 in advance of implementation of this new approach, which was expected to reduce time to complete ABR review of blocks. However, ABR could be resumed in the future with this design improvement integrated into the project.

Assign Resolution Status

Once the ABR staff completed work with a particular pin/issue, they assigned one of the following resolution statuses:

- Fully Resolved.
- Partially Resolved.
- Unresolved.

The BARCA uses this information to determine the final overall block status.

Document Actions Taken to Resolve

If a pin/issue was marked as “Fully Resolved” or “Partially Resolved,” the ABR staff documented the process that resolved the issue (or part of the issue) in the BARCA.

Document Data Sources Used to Resolve Issues

If a pin/issue was marked as “Fully Resolved” or “Partially Resolved,” the ABR staff documented the sources used to resolve the pin in the BARCA. GATRES contains a pick list of common types of sources; however, staff could also input other sources in a free-form text box. The ABR staff could also update the list of sources used for resolution so that other staff could benefit.

Recommend Next Steps

If a pin/issue was marked as “Partially Resolved” or “Unresolved,” the ABR staff recommended the next step and recorded the information in the BARCA. Recommendations included the following:

- Hold for the next DSF Refresh.
- Hold for a GSS file or third-party data acquisition.
- Hold for new imagery.

After reviewing the results of the ABR work, headquarters staff also could make recommendations to identify blocks for fieldwork.

ABR Quality Control [ADC 8-1.1.3.4]

Refer to [Figure 9](#) for a view of the activity that makes up the “ABR Quality Control” operational subactivity.

The ABR work was subject to a QC process, which is a dependent review of the original ABR staff member’s work. This review was conducted by staff with equal or more advanced skills to that of the original reviewer.

ABR Outputs [ADC 8-1.1.3.5]

Refer to [Figure 9](#) for a view of the activity that makes up the “ABR Outputs” operational subactivity.

Block Status [ADC 8-1.1.3.5.1]

Until the staff determined the status, blocks within the ABR workload were assigned an interim status of “Unresolved - Under Review.” The BTD aggregated the issue-level resolution codes to calculate a block-level status. Criteria can determine which statuses are recommended for In-Field Address Canvassing or further rounds of In-Office Address Canvassing.

- ***In-Field Address Canvassing Blocks***

While ABR was occurring, blocks that contained partially resolved or unresolved issues were recommended for In-Field Address Canvassing. Blocks in the “Unresolved - Under Review” state could also be recommended for In-Field Address Canvassing. With the discontinuation of ABR, the blocks referred for In-Field Address Canvassing are determined by block status after IR and other In-Office Address projects, rather than ABR.

- ***On Hold Blocks***

The ABR staff could assign an On Hold status to a block to wait for more data or processes to run. It was originally planned that when the In-Field Address Canvassing recommendation cut-off date was nearly reached, all of these blocks would be released from their On Hold status so that ABR staff could conduct an assessment of In-Field Address Canvassing needs. After ABR was discontinued, all On Hold blocks were triggered for re-review through IR to determine a resolution and conduct an assessment of In-Field Address Canvassing needs.

- ***Passive Blocks***

If all issues within the block were marked as “Fully Resolved,” the block would become a Passive block and would not be recommended for In-Field Address Canvassing. These blocks would remain subject to change monitoring.

Data for MAF Update [ADC 8-1.1.3.5.2]

If the ABR staff submitted address updates during their resolution work, the GATRES tool would create an Address Update File (ADDUP) containing the changed address information, as well as the added information. The MAF Update operation receives ADDUPs and processes them as described in Section 5.2.4. Note that if the ABR staff identified any suspected GQ addresses, they were added to the MAF with a flag that allowed the address to enter the In-Office Address Canvassing GQ/TL process as described below.

3.2.1.4 Change Monitoring (Triggers) [ADC 8-1.1.4]

A detailed view of the constituent activities that make up the “Change Monitoring (Triggers)” operational subactivity is given in Figure 10 below.

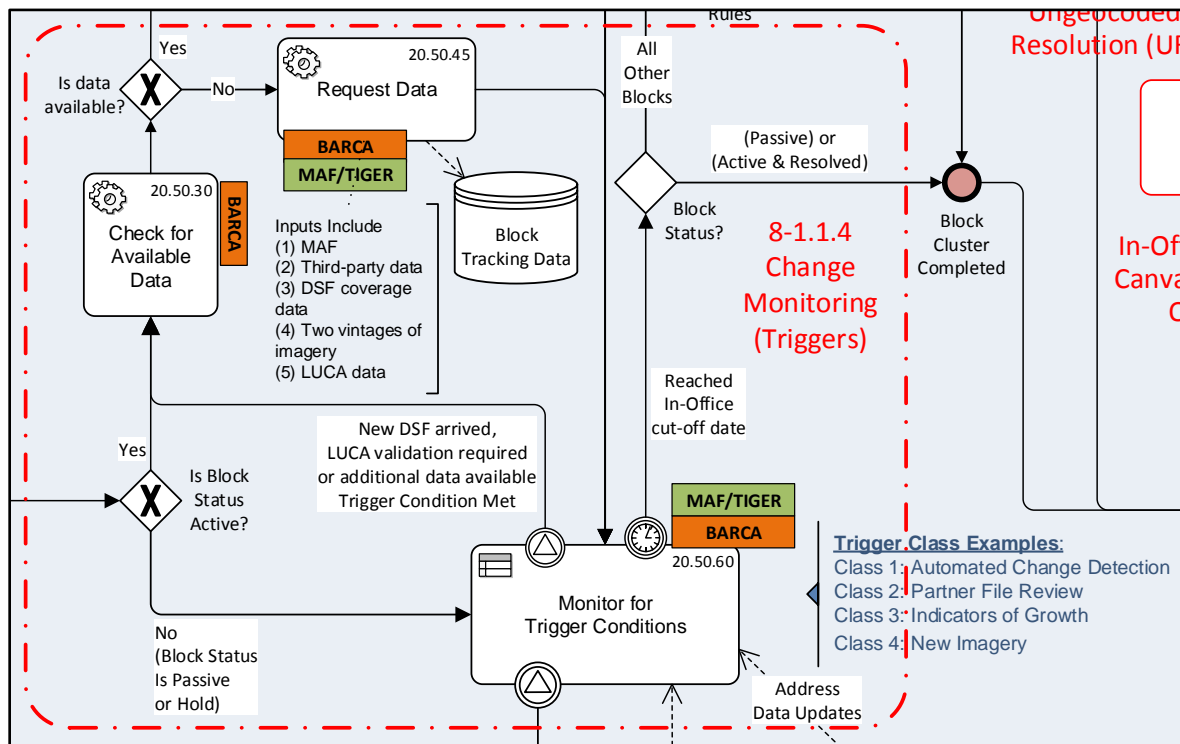


Figure 10: Change Monitoring (Triggers)

In-Office Address Canvassing Triggers are data and processes that identify areas that require IR re-review and identify blocks that need to be sent to other parts of the Address Canvassing process, including blocks for which an In-Office Address Canvassing resolution will improve efficiency and save resources; blocks that are not identified as Active in the IR process; and blocks that require fieldwork that are not identified through the IR and ABR processes. Each type of trigger has specific component data and processes that will

- Prompt an action for IR,
- Prompt for other In-Office resolution (such as UR or wait for MAF/TIGER update), or
- Designate areas for In-Field Address Canvassing (or other field operation).

As research is conducted, triggers may be refined and new triggers implemented within the general categories discussed.

Blocks in the Passive status after initial IR review are subject to continuous monitoring and may be triggered for a re-review in IR (and/or ABR), or could be marked for In-Field Address Canvassing. Blocks requiring updates after IR were subsequently worked in ABR (when this process was in place), or are marked for re-review in IR or other In-Office Address Canvassing processes, or are marked for In-Field Address Canvassing.

There are many positions a block can occupy in the monitoring/trigger process. For example, blocks identified as Active by IR could await work in ABR, and blocks “On Hold” can await acquisition of better imagery.

Since housing unit change is dynamic and not always visible in imagery, this step in the In-Office Address Canvassing activity is designed to capture MAF coverage issues that were not identified in IR or areas that have experienced change since the initial IR and ABR reviews. Without triggers, reengineered address canvassing is a one-way process, with blocks starting in the unworked position pending IR review and making their way through ABR and/or IFAC until blocks end up in a resolved position at the end of the process. Triggers are necessary to move blocks back into the starting position and to move blocks around within the process when appropriate.

Trigger types include:

- The block has been assigned new living quarters in the MAF.
- Updated imagery has become available.
- The block contains areas nominated for update by Census Bureau headquarters staff.
- The block has experienced a natural disaster since 2009.
- The block is “DSF Reliable” (see Section 2.6.2.4 for information).
- The block has been resolved by GEO update activities.

3.2.1.5 In-Field Canvassing Decision [ADC 8-1.1.5]

The In-Field Canvassing Decision operational subactivity is subdivided into the following constituent activities.

- Cut-Off Date [ADC 8-1.1.5.1].
- Decision Rules [ADC 8-1.1.5.2].

A detailed view of the constituent activities that make up the “In-Field Canvassing Decision” operational subactivity is given in [Figure 11](#) below.

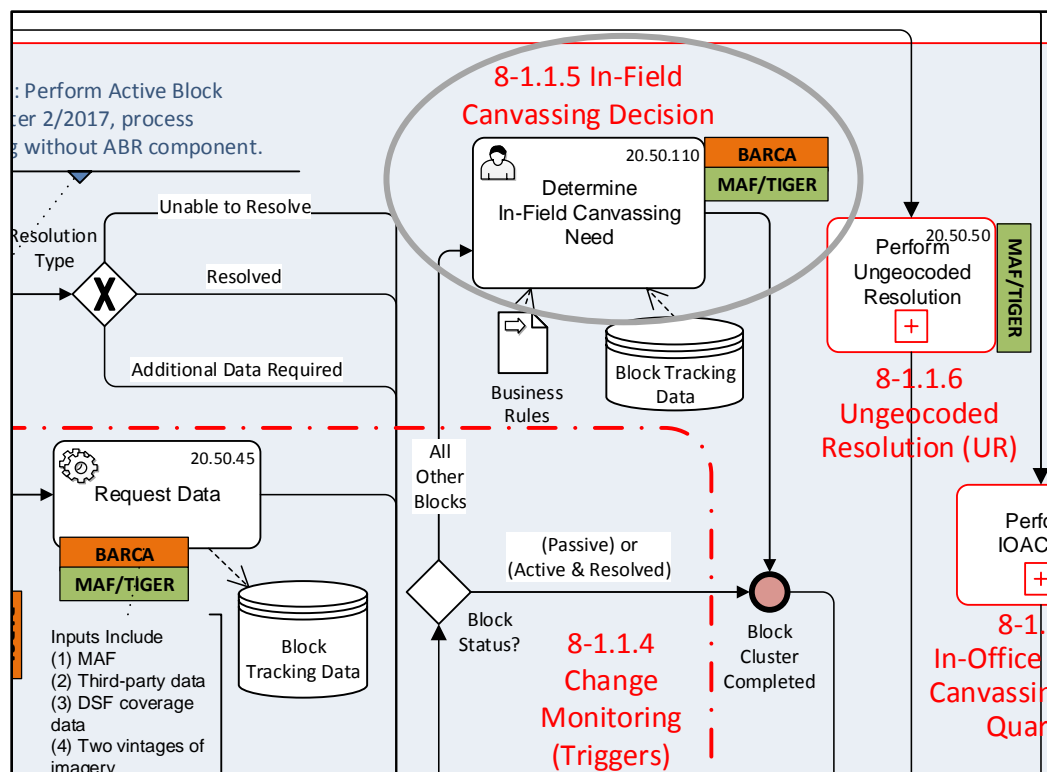


Figure 11: In-Field Canvassing Decision

The In-Office Address Canvassing work must be completed in time to create the workload for the In-Field Address Canvassing operation that starts in August of 2019. To meet that goal, the Census Bureau has set a cut-off date for the In-Office Address Canvassing operational activity and has established a decision process to determine the final In-Field Address Canvassing blocks.

Cut-Off Date [ADC 8-1.1.5.1]

The cut-off date represents the day when all In-Office Address Canvassing work must stop in order to allow time for final In-Field Address Canvassing determinations. As of the date of publication of this document, this date scheduled to be March 29, 2019, based on the amount of time needed for Field Infrastructure preparation and the amount of time needed to process final address updates.

All Active blocks within the BTM have a status for In-Field Address Canvassing work at the completion of the IR. That status can be updated as a result of other In-Office Address

Canvassing work. As the cut-off date approaches, blocks On Hold may enter an abbreviated IR review to decide a quick, final In-Field Address Canvassing determination.

Decision Rules [ADC 8-1.1.5.2]

The In-Field Address Canvassing rules are based on the information from all In-Office Address Canvassing work, as well as other outside factors that influence the inclusion of areas in the In-Field Address Canvassing. The In-Office Address Canvassing results and decision rules determine the In-Field Address Canvassing workload criteria as approved via internal stakeholder review. Blocks to be sent for In-Field Address Canvassing are determined using block status (Active, Passive, or On Hold), various trigger criteria, and decision rules.

The final workload sent to In-Field Address Canvassing is crosswalked from the tabulation blocks worked during the In-Office Address Canvassing process to BCUs worked in the field. BCUs replace the previous system of using Assignment Areas, which consisted of tabulation blocks. As a result, BCUs consist of one or more tabulation blocks, so typically include areas larger than tabulation blocks. The crosswalking/translation process between BCUs and blocks for field assignments ensures that TEA-1 BCUs that contain one or more blocks classified as including evidence of unresolved change and/or MAF coverage issues are sent for In-Field Address Canvassing. For example, if a BCU includes one Passive and one Active block, the BCU will be field canvassed.

3.2.1.6 Ungeocoded Resolution (UR) [ADC 8-1.1.6]

The UR operational subactivity is subdivided into the following constituent activities.

- Ungeocoded Resolution (UR) [ADC 8-1.1.6].
 - Prioritizing the UR Work [ADC 8-1.1.6.1].
 - Managing the UR Work [ADC 8-1.1.6.2].
 - Performing the UR Work [ADC 8-1.1.6.3].
 - UR Quality Control [ADC 8-1.1.6.4].

A detailed view of the constituent activities that make up the UR operational subactivity is given in [Figure 12](#) below.

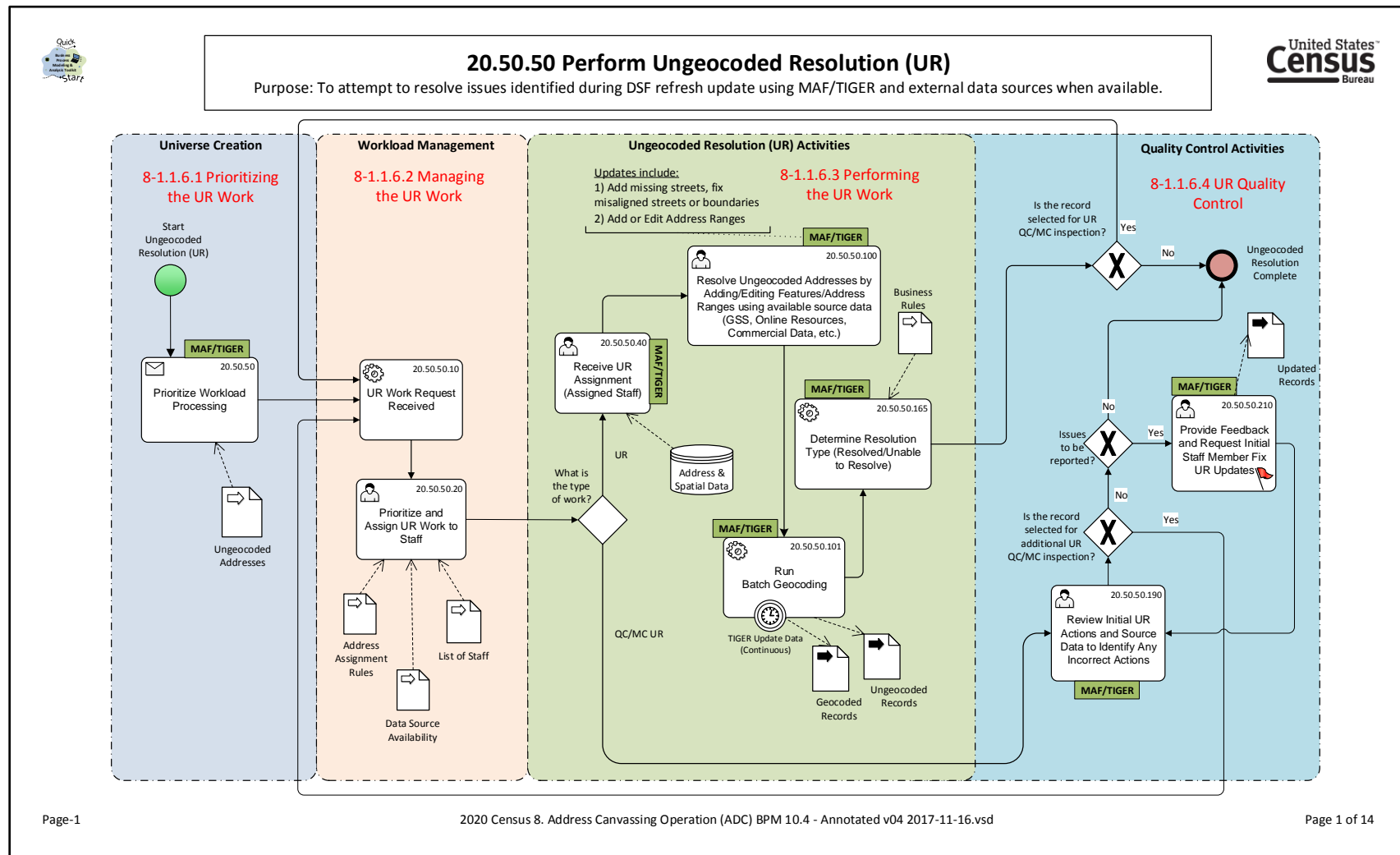


Figure 12: Ungecoded Resolution (UR)

The UR operation is an In-Office Address Canvassing process to assign a census block code to ungeocoded addresses on the MAF. Although the DSF is the primary source of ungeocoded addresses, there are also a small number of ungeocoded addresses in the MAF/TIGER System from current survey and census updates.

As of the spring of 2017, there were approximately 2.8 million ungeocoded residential addresses in the MAF/TIGER System. In general, ungeocoded addresses tend to represent new housing development attributed to population growth away from central urban areas into low-density residential developments (i.e., urban sprawl).

The automated geocoding process that is part of the DSF Refresh attempts to assign census block codes to new addresses by either matching the new address to an address in the MAF/TIGER System with an existing location coordinate or by matching it to an address range in TIGER. This automated process is not able to assign block codes to all addresses. Some reasons for this include:

- The street feature has not been created in TIGER.
- The street feature is missing all or part of the address range in TIGER.
- All or part of the street feature information (e.g., street name spelling, ZIP code) in TIGER may be inconsistent with how the address is represented on the MAF.

As part of UR, the records that were not resolved from the automated DSF update and matching process, and attempts to assign block codes by reviewing local source data that is available in-house as well as online.

Prioritizing the UR Work [ADC 8-1.1.6.1]

Refer to [Figure 12](#) for a view of the activity that makes up the “Prioritizing the UR Work” operational subactivity.

Initially, the operation prioritized ungeocoded records in the MAF in counties with completed GSS updates.⁴ Afterwards, the address assignments are queued in MTAG in priority order influenced by Assignment Business Rules, which take into account some of the following factors:

⁴ GSS updates are likely to reduce the number of ungeocoded records in the MAF/TIGER System, thus creating smaller clerical workloads in the Ungeocoded Resolution operation.

- Ungeocoded records in TEA-1 will be prioritized for work. Ungeocoded records in TEA-2 areas will be low priority for work, as these areas will be canvassed in UL and UE, which includes Remote Alaska.
- The operation will review counties with the highest numbers of ungeocoded records and prioritize those counties first.
- All of the 2018 End-to-End Census Test universe counties were prioritized after counties with the highest numbers of ungeocoded records.
- Work from areas that have committed to participating in LUCA will be prioritized to reduce the number of ungeocoded records first. Then prioritization will shift based on geocoding information received from LUCA participants.
- BCUs that include a small number of Active blocks that would cause a large number of Passive blocks to be referred for In-Field Address Canvassing.

Managing the UR Work [ADC 8-1.1.6.2]

Refer to [Figure 12](#) for a view of the activity that makes up the “Managing the UR Work” operational subactivity.

Work will be assigned in MTAG based on address assignment rules, the list of available UR staff, and data source availability.

Performing the UR Work [ADC 8-1.1.6.3]

Refer to [Figure 12](#) for a view of the activity that makes up the “Performing the UR Work” operational subactivity.

Analysts conduct research using data sources in MaCS and other available online sources to identify the location of the address.

The operation first creates work units for each five-digit ZIP code within a state and county. The work units are divided into ZIP+4 clusters for assignment to analysts. Analysts review the work unit in the MTAG, as adapted for this process. The analysts conduct research to determine the geographic location of each address in their work unit and use MTAG to record any resolutions by making one of the following TIGER updates:

- Adding a new road feature and address range.
- Adding an address range to an existing road feature.
- Adding or correcting a ZIP code associated with an address range.

- Correcting or adding a name on a road feature.

Analysts may also update ungeocoded addresses by:

- Changing the feature name or ZIP code.
- Adding an associated map spot (i.e., coordinate location) or linking to an existing map spot.
- Linking an ungeocoded address to another existing MAF address if they are duplicates.

UR Quality Control [ADC 8-1.1.6.4]

Refer to [Figure 12](#) for a view of the activity that makes up the “UR Quality Control” operational subactivity.

To ensure accuracy in the UR, Quality Control is performed on every Production work unit (WU) completed. This review is conducted by staff with equal or more advanced skills to that of the original reviewer. The QC staff review the initial UR actions and source data to identify any incorrect actions. If QC staff discovers any issues, they provide feedback and request that the initial staff member fix the UR updates.

When a WU in QC does not meet the minimum threshold to pass QC, it is returned to the Production user for Re-Work Production. If a WU passes QC review but has errors, the QC user corrects the errors and the QC user communicates with the Production user regarding these issues. When the WU completes Final QC, a different sample of WU clusters is selected for QC.

The final step of the UR QC check process is Monitoring, referred to as MC within the operation. This process follows the same process as QC, and like the QC process can have up to two levels of review.

3.2.1.7 In-Office Address Canvassing Group Quarters/Transitory Locations [ADC 8-1.1.7]

The In-Office Address Canvassing Group Quarters/Transitory Locations operational subactivity is subdivided into the following Activity Areas.

- In-Office Address Canvassing Group Quarters/Transitory Locations [ADC 8-1.1.7].
 - Prioritizing the In-Office Address Canvassing Group Quarters/Transitory Locations Work [ADC 8-1.1.7.1].
 - Managing the In-Office Address Canvassing Group Quarters/Transitory Locations Work [ADC 8-1.1.7.2].
 - Performing the In-Office Address Canvassing Group Quarters/Transitory Locations Work [ADC 8-1.1.7.3].

A detailed view of the constituent activities that make up the In-Office Address Canvassing Group Quarters/Transitory Locations operational subactivity is given in Figure 13 below.

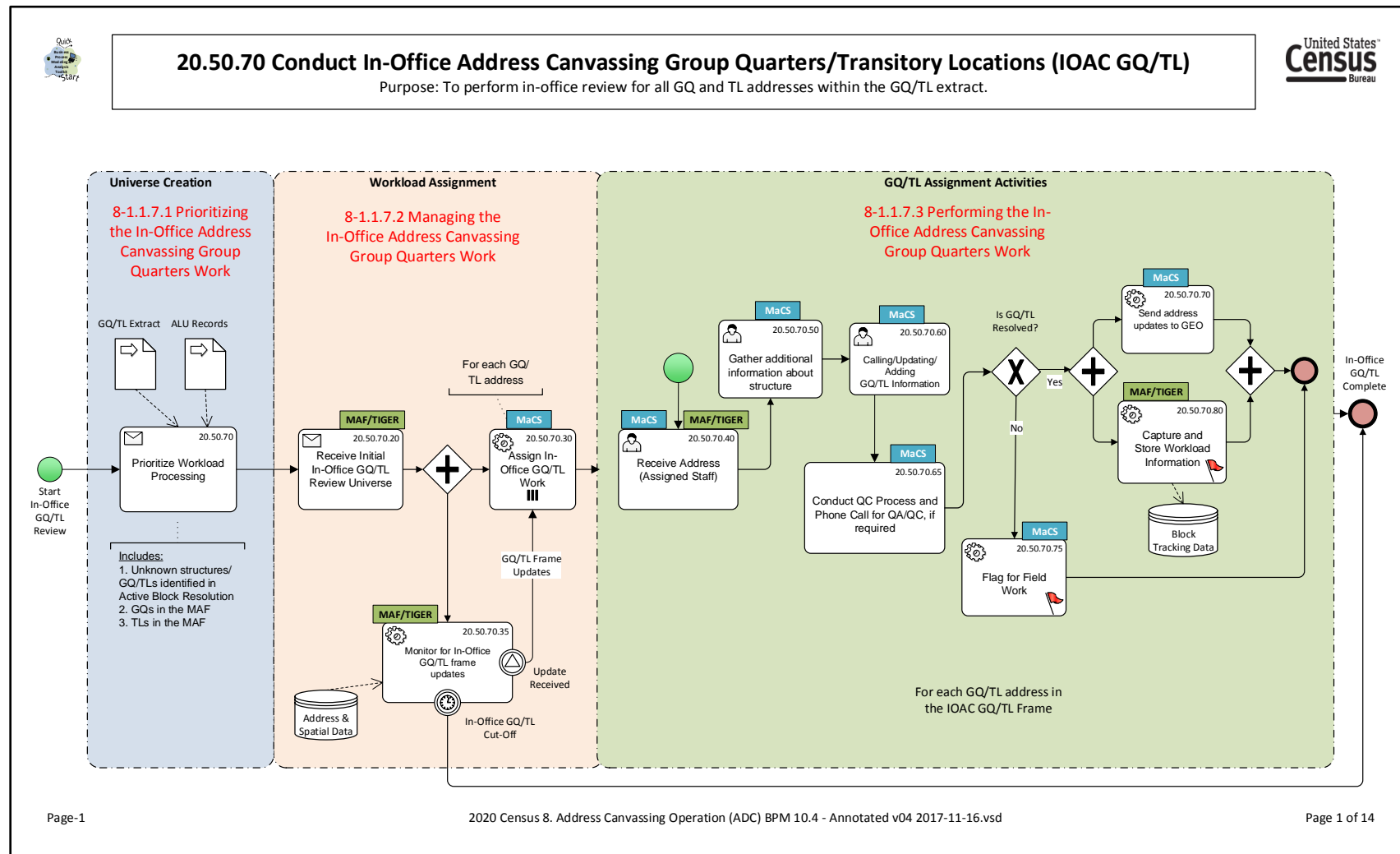


Figure 13: Conduct In-Office Address Canvassing Group Quarters/Transitory Locations

The In-Office Address Canvassing Group Quarters/Transitory Locations process will validate or collect GQ/TL information, such as the type of GQ (college dorm, group home, shelter etc.); GQ facility name; primary contact name at the GQ facility; contact telephone number; and maximum number of people that could live or stay in the GQ.

Prioritizing the In-Office Address Canvassing Group Quarters/Transitory Locations Work [ADC 8-1.1.7.1]

Refer to [Figure 13](#) for a view of the activity that makes up the “Prioritizing the In-Office Address Canvassing Group Quarters Work” operational subactivity.

The GQ and TL records within the MAF predominantly consist of data from the 2010 Census and updates from the ACS Time of Interview (TOI) data. The MAF also contains a universe of suspected GQs, TLs, or unknown structures. These addresses may be GQs or TLs but have not been confirmed. Both GQs/TLs and unknown structures establish the initial GQ address extract (known as the GQ Extract) to be validated in the In-Office Address Canvassing GQ process. The universe of addresses consists of the following:

- All GQs/TLs in the MAF except:
 - ‘101’ – Federal Detention.
 - ‘102’ – Federal Prison.
 - ‘106’ – Military Disciplinary Barracks and Jails.
 - ‘404’ – Military Treatment Facilities and Active duty patients.
 - ‘601’ – Military Quarters.
 - ‘602’ – Military Ships.
 - ‘703’ – Domestic Violence Shelters.
 - ‘706’ – Targeted Non Sheltered Outdoor locations.
 - ‘900’ – Maritime/Merchant Vessels.

Managing the In-Office Address Canvassing Group Quarters/Transitory Locations Work [ADC 8-1.1.7.2]

Refer to [Figure 13](#) for a view of the activity that makes up the “Managing the In-Office Address Canvassing Group Quarters Work” operational subactivity.

Analysts receive access to the GQ Extract, which comprises the initial workload, through MaCS. Each address is assigned for work in MaCS using assignment business rules. As GQ/TL data is added, changed, or removed in the MAF (with updated DSF and field data, etc.), both in the

spring and all of 2019, the GQ Extract will be updated and work will be conducted according to the nature of the changes. The workload will also contain data from the Address List Update operation, which is part of the larger Group Quarters operation. In-Office Address Canvassing Group Quarters/Transitory Locations work will be completed from July 2017 through September 2019.

Performing the In-Office Address Canvassing Group Quarters/Transitory Locations Work [ADC 8-1.1.7.3]

Refer to [Figure 13](#) for a view of the activity that makes up the “Performing the In-Office Address Canvassing Group Quarters/Transitory Locations Work” operational subactivity.

A detailed description of the constituent activities that make up the “Conduct In-Office Address Canvassing Group Quarters/Transitory Locations” operational activity is given below. The goals of the process steps outlined below are to confirm that the current MAF GQs/TLs are still used as GQs/TLs and to obtain sufficient contact information needed to validate the unconfirmed records and unknown structures as a GQ/TL, housing unit, nonresidential, or transitory location. Note that the process steps outlined below are on a continuous cycle, and each step will occur more than once prior to the start of the 2020 Census.

Conduct Internet Search

Any unconfirmed GQ address records and unknown structures require internet research and/or telephone calls (by NPC staff) to obtain relevant contact information.

Review Process

Once adequate contact information is obtained, NPC staff contact a knowledgeable source and ask a series of questions outlined by the GQ Call Script to validate unconfirmed records and unknown structures as a GQ, housing unit, transitory location, or nonresidential. These address records are geocoded if possible.

If the structure type is determined to be a GQ, NPC staff collect the GQ type (e.g., college dorm, group home, shelter, etc.); GQ name; GQ address; facility name; primary contact name of the GQ; contact telephone number; and maximum number of people who could live or stay in the GQ. If the structure type is determined to be a TL, the only additional information collected is the date that the TL opened.

Quality Control Process

The GQ/TL QC process focuses on verifying and validating the information that is collected during the production phase. QC consists of a new phone call when this option available, or if this option is not available, an alternate contact method (such as internet research) is used, as needed. The QC process checks three main areas: 1) Update Information, 2) Phone/Contact Result, and 3) Record Resolution for GQ/TL records. QC focuses on the accuracy of the update

data by reviewing that information in the records is complete and that the correct resolution was selected. The resolution of each record is also to be reviewed during the QC process through a comparison of the resolution to the previous update of the record's information.

Update MAF

Address records validated as a GQ, housing unit, transitory location, or nonresidential will update the MAF. Any remaining unvalidated records or unknown structures that lack sufficient contact information during internet research efforts are summarized.

Unvalidated GQs or unknown structures within a Passive block will not cause the block to be changed to an "Active" status for In-Field Address Canvassing. Instead, these structures will be referred to other operations for further work.

3.2.1.8 LUCA Address Validation [ADC 8-1.1.8]

The LUCA program provides, by law, the opportunity for tribal, state, and local governments to review and comment on the Census Bureau's address list to ensure an accurate and complete enumeration of their communities. The In-Office Address Canvassing LUCA Address Validation component consists of In-Office review of LUCA addresses that could not be initially validated through a match to the MAF and other designated records. The LUCA Address Validation operational subactivity is subdivided into the following Activity Areas.

- LUCA Address Validation [ADC 8-1.1.8]
 - Prioritizing the LUCA Address Validation Work [ADC 8-1.1.8.1]
 - Managing the LUCA Address Validation Work [ADC 8-1.1.8.2]
 - Performing the LUCA Address Validation Work [ADC 8-1.1.8.3]

A detailed view of the constituent activities that make up the "LUCA Address Validation" operational subactivity is given in Figure 14 below.

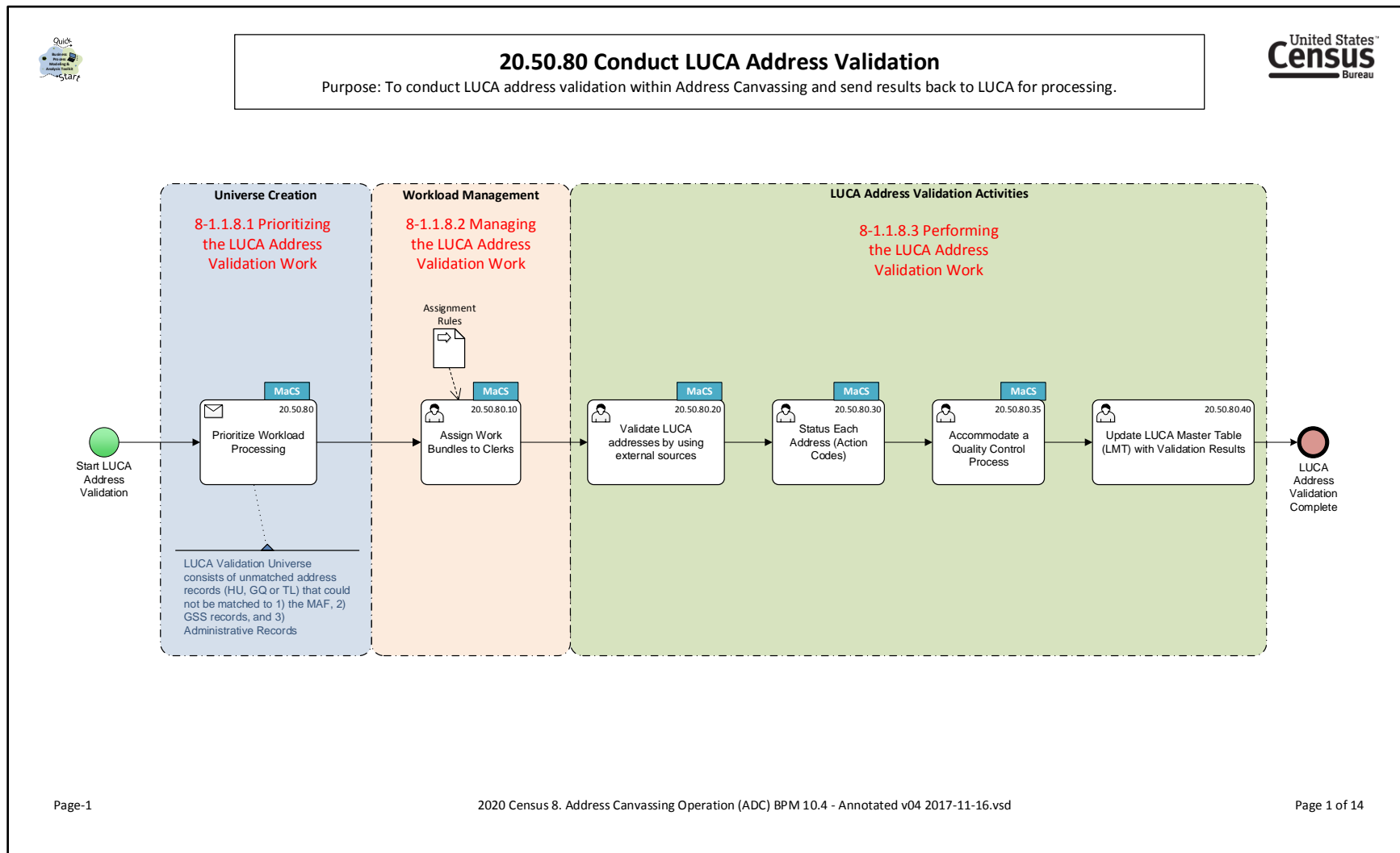


Figure 14: LUCA Address Validation

Prioritizing the LUCA Address Validation Work [ADC 8-1.1.8.1]

Refer to Figure 14 for a view of the activity that makes up the “Prioritizing the LUCA Address Validation Work” operational subactivity.

LUCA Address Validation will prioritize work assignments based on the date the submission was received. As LUCA submissions are processed and entities become eligible to be worked, the MaCS system will automatically assign work to users.

LUCA Address Validation will receive addresses from the following scenarios:

- Participant “Adds” that do not match to an existing GSS or MAF/TIGER record.
- Participant “Adds” that match to MAF/TIGER but the local participant locates the record in a different block.
- Participant “Change” records where the local participant moved the existing address record into a different block.

LUCA Address Validation will not adjust any participant address components. The process will only determine if an address record exists or if the MAF version is more spatially accurate. Reviewers may also determine the address record belongs in a block other than what the LUCA participant or MAF has indicated.

Managing the LUCA Address Validation Work [ADC 8-1.1.8.2]

Refer to Figure 14 for a view of the activity that makes up the “Managing the LUCA Address Validation Work” operational subactivity.

MaCS will be used to manage the workload for LUCA Address Validation. A separate production control system for LUCA will control the workflow and determine when an entity is eligible to be worked in MaCS. The work will be grouped by entity and auto-assigned to reviewers. The system also allows administrators to manually assign work to reviewers and quality control staff if desired. Once all records are completed through the quality control process within LUCA Address Validation, then they will be sent back to the main LUCA operation to complete the rest of the LUCA process.

Performing the LUCA Address Validation Work [ADC 8-1.1.8.3]

Refer to Figure 14 for a view of the activity that makes up the “Performing the LUCA Address Validation Work” operational subactivity.

NPC staff will conduct LUCA Address Validation using a module within MaCS. Clerks will only validate the existence of address records. Actions consist of two subcategories: Accept and Reject. The Accept category includes: Address Validated, Provisional Add, Move, and Manual Match. The Reject category includes: Address Rejected, Uninhabitable, Nonresidential Address,

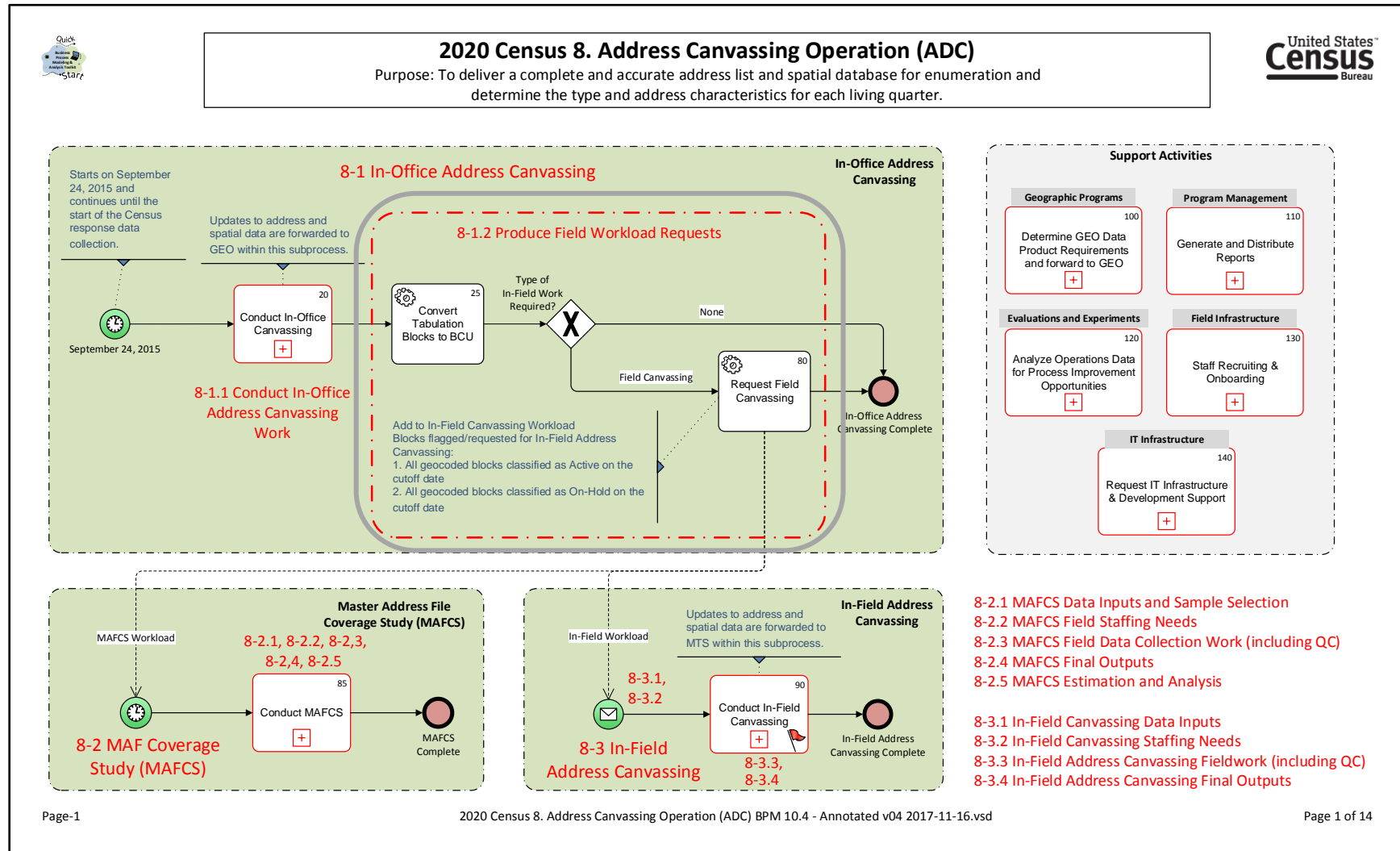
and Outside of Jurisdiction. Users take actions on a participant's records and not on MAF records. Feedback will be sent to participants based on matching and other In-Office Address Canvassing operation results.

Quality Control (QC) Process

The LUCA Address Validation QC process will be completed for each record that requires LUCA Address Validation. The QC process focuses on reviewing the accuracy of individual records worked by clerks during production. The QC staff focus on the action taken by reviewers and determine whether or not it is a proper assessment of the LUCA participant's submission. If the QC staff member deems the reviewer used an incorrect action code, then the reviewer will be responsible for correcting the action and placing the address record in the correct spatial location, if necessary. Feedback codes will be assigned to records where the reviewer deemed that an inaccurate action was taken on the LUCA record. These feedback codes will be tallied in reports and common errors will be relayed to clerks so mistakes are understood and reduced as the production process moves forward.

3.2.2 Produce Field Workload Requests [ADC 8-1.2]

Figure 15 shows the BPM for the Produce Field Workload Requests [ADC 8-1.2] activity area (area within the gray rounded rectangle) and its constituent activities within the overall context of the ADC operation.



The Address Canvassing In-Office Address Canvassing operational activity produces Fieldwork Requests for the Address Canvassing operation (ADC) In-Field Address Canvassing Operational Activity. Field workload requests are produced by GEO using block status (Active, Passive, or On Hold), various trigger criteria, and decision rules. Using decision rules, BCUs that contain all or parts of blocks requiring fieldwork are identified as the universe for In-Field Address Canvassing and are used to produce MAF extract and geographic reference files (GRFs) for use within field systems and devices for In-Field Address Canvassing. This data is then used by Field Division (FLD) to perform In-Field Address Canvassing.

4 MAF Coverage Study [ADC 8-2]

This section describes the details of how the MAF Coverage Study [ADC 8-2] was conducted as part of the Address Canvassing operation of the 2020 Census. An overview of the activity is presented, followed by detailed process descriptions using Business Process Model and Notation (BPMN) to depict the steps in the activity and the key information flows. Refer to the Activity Tree in Appendix C for a list of all of the major operational activities and subactivities associated with the ADC operation.

The MAF Coverage Study (MAFCS) [ADC 8-2] was planned to be an ongoing Address Canvassing activity designed to meet the following objectives:

- Produce MAF coverage estimates at national and subnational levels.
- Provide continuous updates to the MAF for current surveys and the 2020 Census.
- Evaluate the In-Office Address Canvassing results.

The MAFCS was successfully carried out in 2016 and during the first half of 2017, but was discontinued on April 1, 2017. As a result, MAFCS operations are detailed here as they existed before that date.

4.1 Design Overview

The MAFCS leveraged existing Census Bureau programs and systems to achieve the MAFCS objectives. The Community Address Updating System (CAUS) program, a program that supports the address list updating needs for the ACS, traditionally selected up to 1,500 blocks to canvass each year. In 2016 and 2017, CAUS and the MAFCS combined to select approximately 20,000 blocks each year. The MAFCS began fieldwork in April of 2016 and was originally planned to continue annually through September of 2019.

The Demographic Area Address Listing (DAAL) operation is the primary field operation the Census Bureau conducts to list blocks during non-decennial years. The DAAL operation includes assignments for both current surveys and decennial operations. Types of assignments traditionally include:

- CAUS, and the MAFCS updates.
- National Health Interview Survey (NHIS) listings.
- GQ frame updates for current surveys.

Field Representatives (FRs) canvass assigned blocks looking for every place where people could live or stay. They collect the address data using the LiMA. In general, this listing activity is the same as the traditional In-Field Address Canvassing for the 2020 Census.

The MAFCS was designed to produce yearly MAF coverage estimates for the United States. Coverage estimates for Puerto Rico were planned to be included during work in FY2018, the third year of implementation.

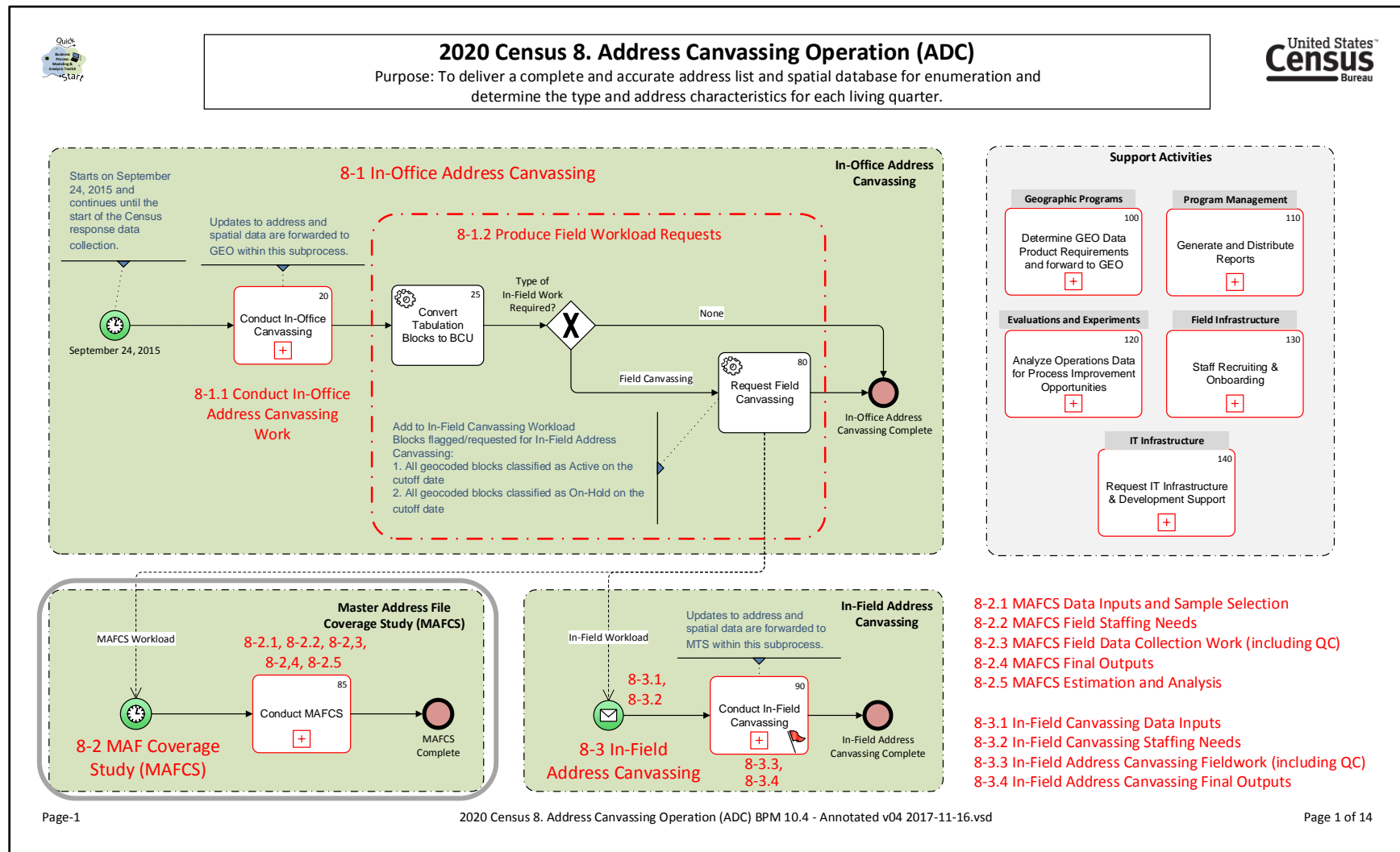
The 2016 MAF coverage estimates were based on a probabilistic sample of 18,500 blocks canvassed in the six-month period between April and September of 2016. The remaining 1,500 blocks were selected to meet specific CAUS criteria and to supply a consistent workload prior to April of 2016, while field staff simultaneously prepared for the increased workload in April by recruiting and hiring new FRs. Beginning in FY2017, the 20,000 sample blocks were planned to be evenly distributed across a 12-month period. This strategy was designed to allow for a consistent field workload, thus eliminating the need for irregular cycles of hiring and training.

The coverage estimates are important for understanding the quality of the MAF and monitoring how that quality changes as the Census Bureau continuously updates the MAF. In addition, the related analysis was designed to determine the characteristics of the areas that have the most significant quality concerns. That information could then be used to guide process improvement efforts.

4.2 Detailed Process Description

Figure 16 is a top-level BPM diagram showing the MAF Coverage Study operational activity [ADC 8-2] (area within the gray rounded rectangle) and its constituent activities within the overall context of the ADC operation.

In addition, a detailed view of the constituent activities that make up the MAFCS operational activity is given in Figure 17 below.



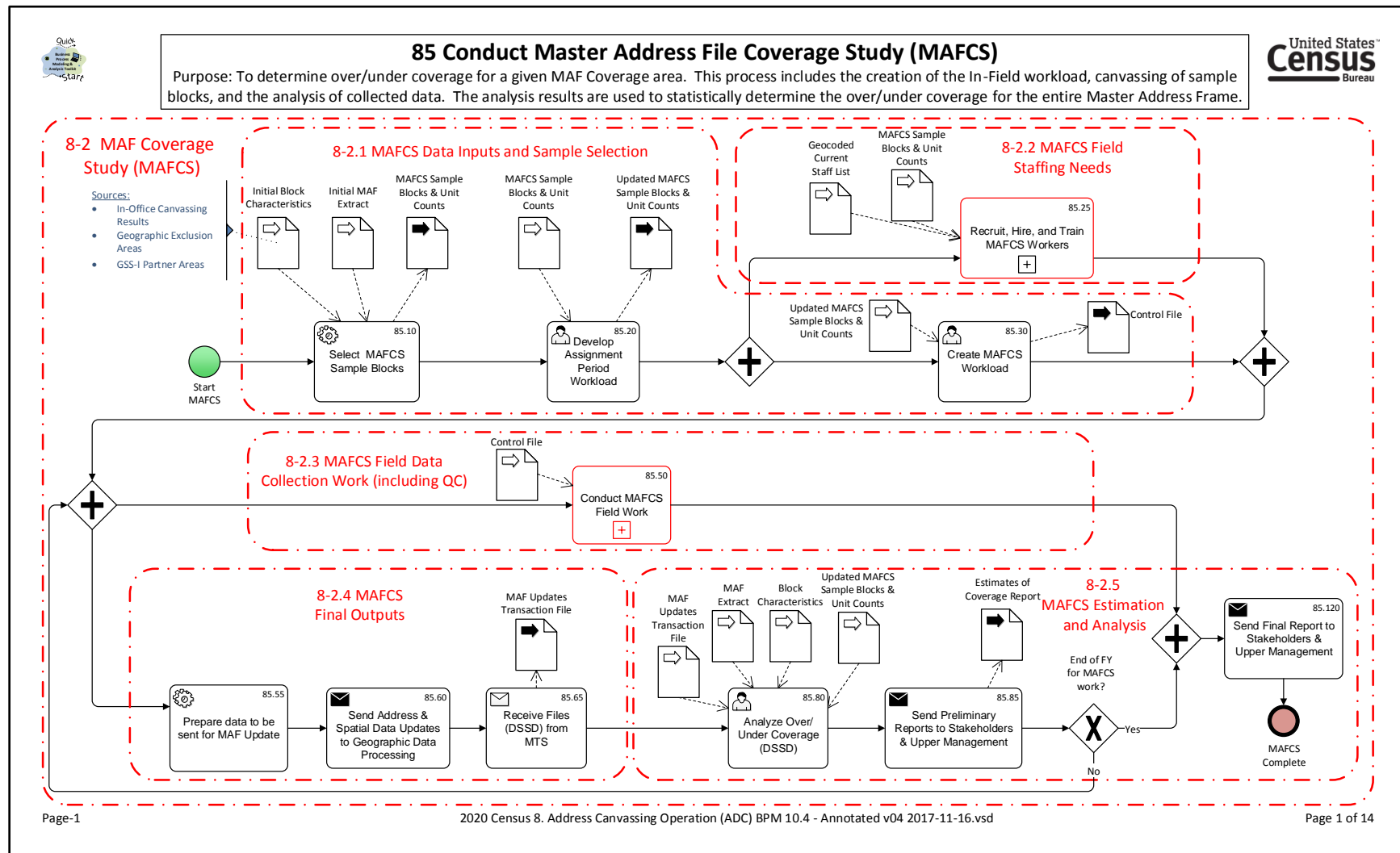


Figure 17: MAFCS Constituent Activities

The MAF Coverage Study Operational Activity [ADC 8-2] is subdivided into the following Activity Areas.

- MAFCS Data Inputs and Sample Selection [ADC 8-2.1]
- MAFCS Field Staffing Needs [ADC 8-2.2]
- MAFCS Field Data Collection Work [ADC 8-2.3]
- MAFCS Final Outputs [ADC 8-2.4]
- MAFCS Estimation and Analysis [ADC 8-2.5]

Subsequent sections describe the MAFCS operational activity in detail.

4.2.1 MAFCS Data Inputs and Sample Selection [ADC 8-2.1]

Refer to [Figure 17](#) for a view of the activity that makes up the “MAFCS Data Inputs and Sample Selection” operational subactivity.

The “MAFCS Data Inputs and Sample Selection” operational subactivity is subdivided into the following constituent activities.

- MAFCS Sample Selection [ADC 8-2.1.1]
- MAFCS Control File Creation [ADC 8-2.1.2]

4.2.1.1 MAFCS Sample Selection [ADC 8-2.1.1]

The MAFCS sample design assured that the collected data were sufficient for meeting all stated objectives. The primary objective was to produce MAF coverage estimates; however, the sample also supported address updates needed for current surveys and the analysis of In-Office Address Canvassing processes. The sample also allowed for coverage estimate breakouts at subnational levels and comparisons of urban versus rural areas. DSSD and GEO worked together to select the sample and create the Sample Control Input File (SCIF), which enabled the field control systems to identify and process field assignments.

Selecting the Sample

For FY 2016 MAFCS work, DSSD and GEO selected the sample in two parts. First, they selected a smaller sample of 1,500 blocks slated for data collection between October of 2015 and March of 2016. These blocks primarily represented areas that met traditional CAUS criteria, in areas where the DSF from the USPS was believed deficient. The CAUS blocks were not included in the first year’s coverage estimates since they were not selected using probabilistic sampling methods.

The second, larger sample of 18,500 blocks was selected using probabilistic sampling methods. The sample universe was selected from approximately 11.2 million tabulation blocks, excluding

Puerto Rico, Remote Alaska, special land use areas, water blocks, and the 1,500 blocks selected for CAUS in that same year. Blocks were clustered geographically within tracts in order to minimize field costs. The 2016 MAFCS included a complex, probability sample design. All blocks in the nation were stratified into 55 non-overlapping areas: the 50 states, the District of Columbia, and the four largest cities (New York, Los Angeles, Chicago, and Houston). Each of those was further stratified based on the size of the block. Within each size strata, clusters of blocks (the ultimate sampling units [USUs]) were selected using a systematic probability proportional to size sampling method with the number of addresses in a USU as a measure of size. Refer to the MAFCS sample design documentation (Rottach, 2015) for the details.

For the FY2016 MAFCS, field data was collected for the 18,500 blocks between April and September of 2016. Starting in Fiscal Year 2017, a sample of 20,000 MAFCS blocks was selected for the entire year at one point in time, and data collection was planned to occur between October 1 and September 30 during each fiscal year.

MAFCS sample blocks were divided into three (FY 2016) or six (beginning FY 2017) two-month assignment periods. The assignment period was the amount of time allotted for the field data collection. The sample blocks were also clustered geographically within an assignment period to allow for more efficient field data collection.

4.2.1.2 MAFCS Control File Creation [ADC 8-2.1.2]

Once the sample selection was final, DSSD sent a list of the sample blocks with their expected living quarters count to FLD for review. FLD used this information to determine the optimal work allocation while considering DSSD's suggested geographic clustering. FLD also identified any "red flags" for the data collection (e.g., the block was unable to be worked). FLD approved the workload and sent the information back to DSSD. DSSD then sent the sample block and assignment period information to GEO, who created the SCIF.

The MAFCS data collection, like In-Field Address Canvassing, is a dependent address-listing activity. That is, FRs provided updates to the existing address list and maps instead of creating new ones. The address list does not include the complete list of addresses from the MAF. Instead, the addresses were a subset of the addresses on the MAF that meet specific requirements as described in Section 2.5.2. The MAF/TIGER System extracted the valid addresses and created a national extract of the MAF.

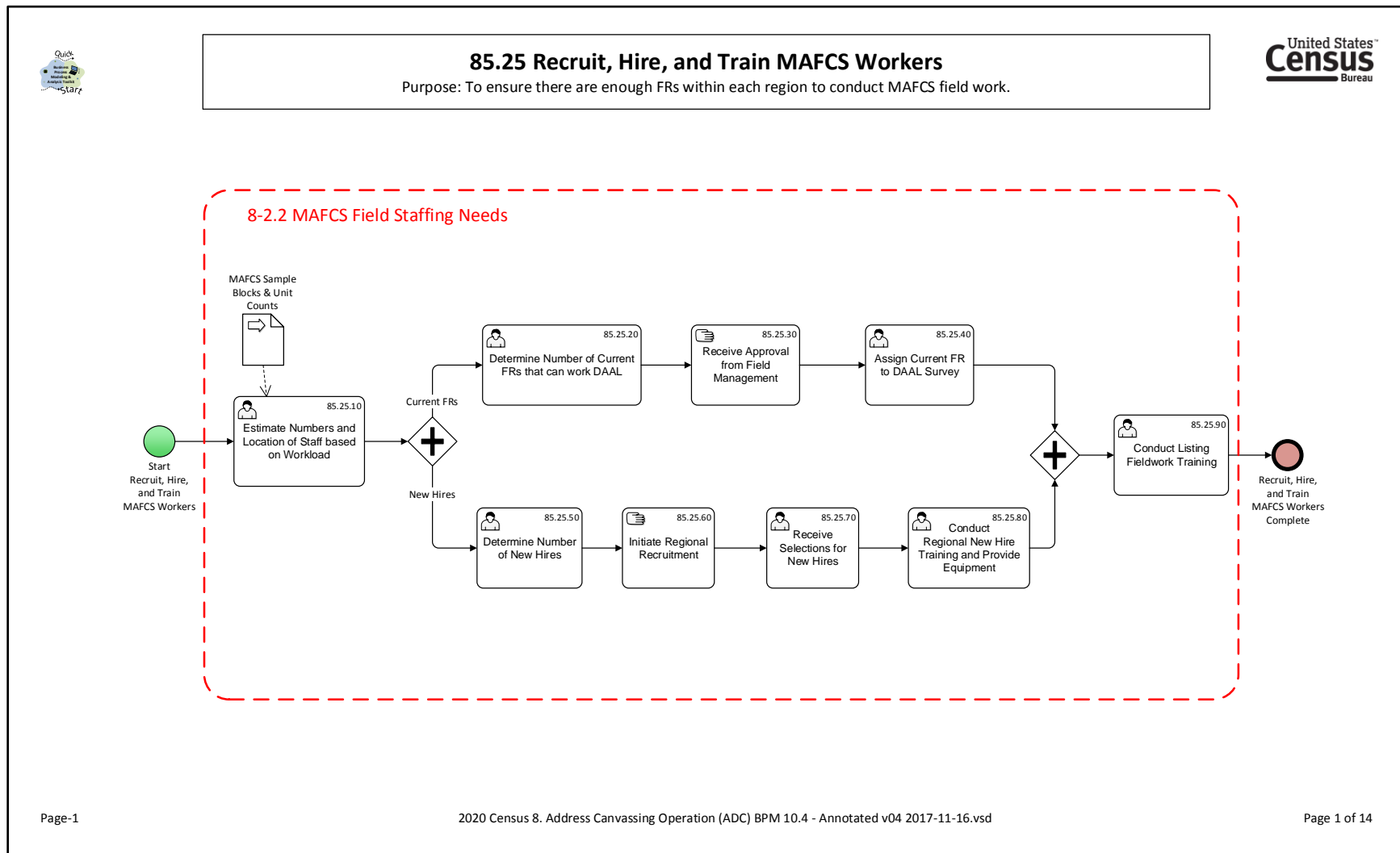
The associated extract from TIGER, which contained the street features, block boundaries, and geographic entities, was also created. GRFs provided additional information such as names for geographic areas, and the relationships between the lowest geographic area, block, and higher levels such as county, state, and regional office (RO). The MAF/TIGER System makes all of these data available to the DAAL data collection systems twice a year, in April and October.

4.2.2 MAFCS Field Staffing Needs [ADC 8-2.2]

The “MAFCS Field Staffing Needs” operational subactivity is subdivided into the following constituent activities.

- MAFCS Field Staff Estimation [ADC 8-2.2.1]
- MAFCS Field Staff Recruiting and Hiring (via regions) [ADC 8-2.2.2]
- MAFCS Field Staff Training Support [ADC 8-2.2.3]

A detailed view of the constituent activities that make up the “MAFCS Field Staffing Needs” operational subactivity is given in [Figure 18](#) below.



Page-1

2020 Census 8. Address Canvassing Operation (ADC) BPM 10.4 - Annotated v04 2017-11-16.vsd

Page 1 of 14

Figure 18: MAFCS Field Staffing Needs

The MAFCS Field Staffing Needs activity was handled by the Census Bureau FLD regional offices (ROs). The ROs in Atlanta, Chicago, Denver, Los Angeles, New York, and Philadelphia manage the DAAL operation that was leveraged for the MAFCS Field Data Collection activities. The DAAL staff in the RO usually includes RO supervisors, clerks, survey statisticians, and geographers. The RO staff performs tasks such as:

- Making listing assignments to FRs.
- Monitoring progress to ensure deadlines are met.
- Closing out the listing as scheduled.
- Troubleshooting in-field technical and procedural issues.
- Ensuring RO staff follow security policies and procedures.
- Hiring and training FRs.

FRs can and do work on other census field operations such as interviewing for ACS and other census surveys. They are responsible for organizing all assigned work and planning their day efficiently. FRs report to field supervisors (FSs).

4.2.2.1 MAFCS Field Staff Estimation [ADC 8-2.2.1]

Field staff estimation for MAFCS was based on MAFCS sample blocks by geographic area, which was sent to FLD by DSSD at the beginning of the year. Staff needs were then determined and managed by each RO.

4.2.2.2 MAFCS Field Staff Recruiting and Hiring (via Regions) [ADC 8-2.2.2]

The DAAL FRs receive constant work from either DAAL alone or a combination of DAAL and other current surveys. FLD recruiting and hiring efforts occur in response to attrition or changes in workloads. The introduction of the MAFCS workload to DAAL in the spring of 2016 (with a consolidated six-month data collection period) required a significant hiring effort in the winter. FLD started recruiting in December of 2015 to hire approximately 220 additional FRs. As the MAFCS workload became steady, hiring and recruiting efforts settled into lower levels, or targeted areas where gaps in geographic coverage were found. An overview of the recruiting and hiring process is provided below.

Recruiting

For DAAL, recruiting takes place only when ROs determine that additional staff are needed to support the anticipated workload. First, the RO locates physical space to test recruits in the geographic area. The RO may either contact people already in a queue waiting to be tested,

contact local partners, place an advertisement, or a combination of all of these to get a list of people to invite to the session. Applicants who complete the test at the session become part of the applicant pool.

Hiring

In areas where it is determined that DAAL FRs are needed, the current staff that do not already work DAAL are considered first. If no current staff are available, then a new hire is requested on a selection certificate in that geography. If there is a sufficient applicant pool, applicants are interviewed, and a selection is made. If there is an insufficient applicant pool, recruiting sessions take place.

Post-Selection

If the selected applicant is a brand new hire, the applicant takes their Census Bureau security training, and the laptop request process begins. Prior to taking the FR classroom training as described in Section 4.2.2.1 below, RO staff administers the Oath of Non-Disclosure, and the FR signs a sworn affidavit. The FR then receives their laptop and pre-classroom training.

4.2.2.3 MAFCS Field Staff Training Support [ADC 8-2.2.3]

Starting in September of 2015, the classroom training included a Web-Based Training (WBT) component for MCM and LiMA. The automated, interactive training for FRs was developed with a “Tell Me, Show Me, and Let Me Try” theme. The instructor first explains a topic to the classroom and then shows them how the process would work via the WBT, which simulates MCM and LiMA actions. FRs follow along in the WBT with the instructor. FRs then individually complete a series of interactive WBT exercises in the classroom.

The training sessions last for three days. On the last day, FRs complete field exercises that include canvassing a real block near the training site. RO staff observe these exercises and provide feedback to the FRs.

The Census Bureau’s TAC is the central point of contact for automation support for all RO staff and FRs. The TAC provides support for all major field data collection operations for current surveys, Special Censuses and Computer Assisted Telephone Interviewing. RO and field staff receive support for all data collection applications and laptop issues, including transmissions. FRs do not contact TAC; they coordinate assistance through the FS, the SSO, and the RO automation staff. If the laptop issues cannot be resolved, the RO staff may direct FRs to receive assistance directly from TAC.

4.2.3 MAFCS Field Data Collection Work (including QC) [ADC 8-2.3]

The “MAFCS Field Data Collection Work” operational subactivity is subdivided into the following constituent activities.

- Managing the MAFCS Field Data Collection Work [ADC 8-2.3.1]

- Performing the MAFCS Field Data Collection Work [ADC 8-2.3.2]
- Conduct MAFCS Quality Control (QC) Support Activities [ADC 8-2.3.3]

A detailed view of the constituent activities that make up the “MAFCS Field Data Collection Work” operational subactivity is given in Figure 19 below.

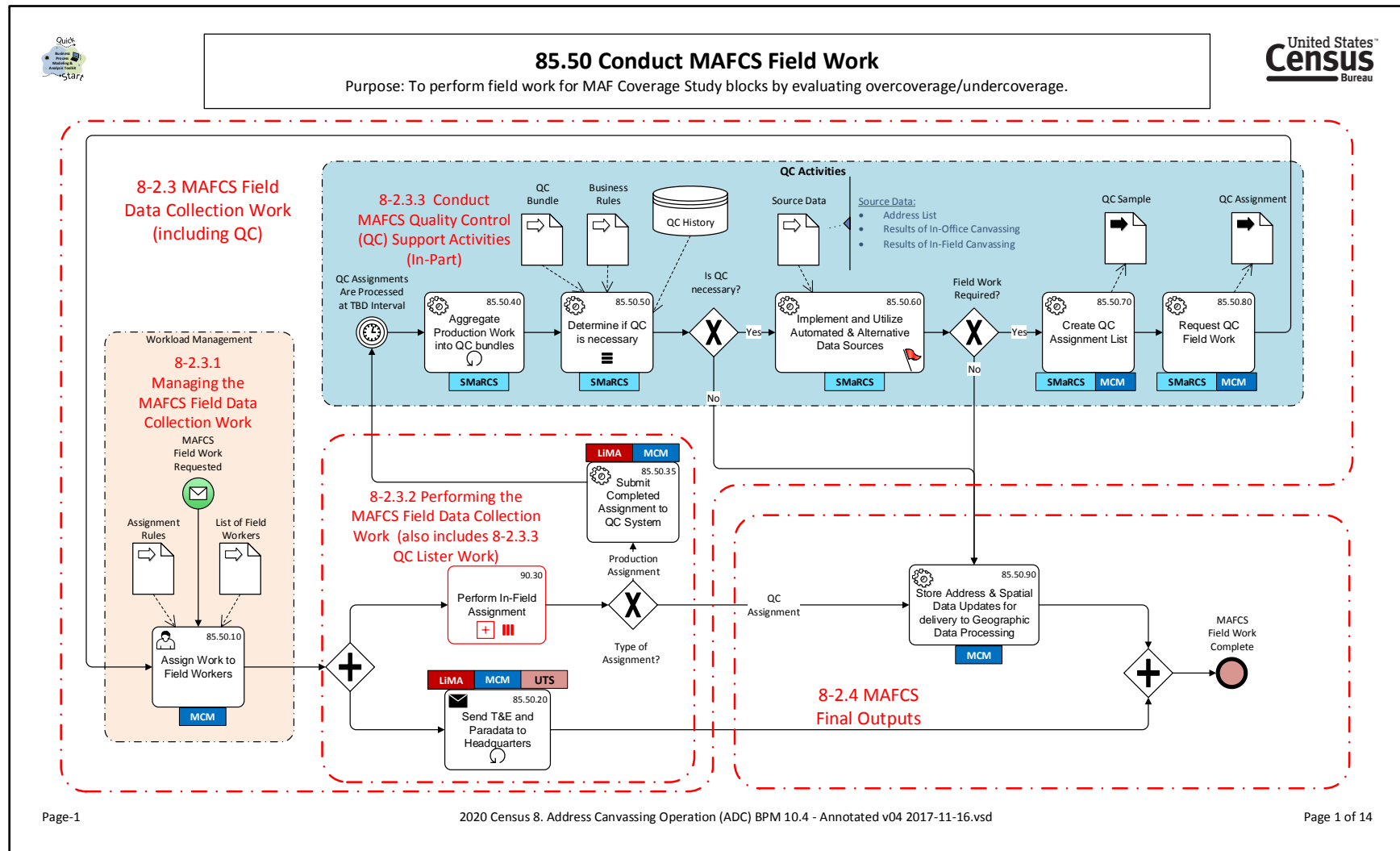


Figure 19: MAFCS Field Data Collection Work (including QC)

4.2.3.1 Managing the MAFCS Field Data Collection Work [ADC 8-2.3.1]

Refer to [Figure 19](#) for a view of the activity that makes up the “Managing the MAFCS Field Data Collection Work” operational subactivity.

The yearly block sample was divided into field assignment periods representing two months of fieldwork. At the start of the assignment period, ROSCO received the sample block information via MCS. RO staff used ROSCO to assign the work to each FR based on the geographic location.

Assign Work to Field Workers (Production or QC)

The FS reviewed assignments made to field staff in their area. For the production listing, the FS reviewed the assignments to determine proximity of the block(s) to the personal residence of the FR and ensure the assignments were made in the most cost-efficient manner. QC (which was planned for implementation in 2018) was planned to be conducted by FSs. The production and QC work was designed so as not to be conducted by the same person for a particular assignment. FRs received their work assignments through MCM on their laptop.

Reporting and Assignment Closeout

DAAL progress reports are updated in the control systems each time the field staff transmit their completed assignments. The reports list the total number of blocks in the region’s workload, the number of blocks completed and the percentage of blocks completed. Once all blocks are complete at the end of the assignment period, the RO performs a close out and all data are sent to either SMaRCS for QC or to the MAF/TIGER System for update.

4.2.3.2 Performing the MAFCS Field Data Collection Work [ADC 8-2.3.2]

Refer to [Figure 19](#) for a view of the activity that makes up the “Performing the MAFCS Field Data Collection Work” operational subactivity.

To perform the field data collection, FRs canvass assigned blocks with their laptops, equipped with MCM and LiMA, in hand. The LiMA displays the Census Bureau’s existing address list and maps. In addition, the laptop is equipped with a Global Positioning System (GPS), which enables the LiMA to display a “you are here” indicator (YAH) so FRs can determine their location on the ground and collect accurate location coordinates for living quarters. FRs compare what they observe on the ground to the LiMA address list and maps and make updates when necessary. This method is known as “ground-to-list.”

The following steps detail the field data collection process.

Receive Device and Worker Assignment

Prior to training, each FR receives a laptop, which they use to complete all work assignments. The FR must safeguard the laptop and its information in compliance with Census Bureau security policies. The FR performs a data transmission in order to receive their individual work assignments (blocks) and data.

Locate and Travel to Assignment

Each FR reviews their work assignments for DAAL and other surveys in MCM and determines the best order for performing the work, as well as the best route of travel. MCM displays a map of the assigned blocks and their associated geographic center pinpoint locations to aid the FR with this activity. However, the FR does not use the MCM to navigate to a block. Instead, the FR uses their local knowledge as well as a commercial navigation device to travel to their block assignment.

Once in the block, FRs select the option to work the block in MCM, which launches the LiMA for the block. FRs use the YAH! in the LiMA to help determine their location on the ground. FRs choose an intersection to begin their canvassing activities in the block. From the starting point, they travel the block in a clockwise direction, always turning to the right at each intersection. FRs stop at each structure they encounter on their right hand side only. At multi-unit structures, FRs attempt to find a manager, property owner, or some other knowledgeable source to obtain the update information for all living quarters in the structure. If need be, FRs walk through the entire structure, canvassing at each level to confirm every unit in the structure.

FRs complete the activities that follow for each structure.

Compare Ground to Address List

During fieldwork, FRs identify the location address based on visual observation or by talking to a knowledgeable person at each structure they encounter on the ground. (Note that this is slightly different from the procedure for In-Field Address Canvassing, for which all listers are instructed to attempt to make contact with a knowledgeable person.) FRs then look for the same address in the LiMA address list for the block.

Update/Verify the Address List

As the FR compares what they see on the ground to the address list, they verify or update the address and location information in the LiMA. In general, FRs complete the following tasks:

- If the address is on the address list, they will confirm the existing information and provide updates as necessary.
- If the address is not on the address list, they will add it.
- If addresses remain on the list that they did not encounter during their ground canvass, they will either:
 - Move the address to an adjacent block in the fringe area that is within 150 feet of the block they are canvassing (e.g. the address is across the street).
 - Identify the address as a delete/does not exist in the block.

- Collect location coordinates for existing living quarters and update the maps as necessary by adding or updating street names.

The following paragraphs provide more details for the work completed during this Update/Verify phase.

Collect Address Status and Structure Type (Update/Verify the Address List)

The FR first assigns an address status code, which identifies the address as a housing unit, a GQ, does not exist, or some other status. The FR also collects a structure type for each living quarter. The structure type indicates the type of building in which the living quarter is located. Structure types are as follows:

- Single Family Home
- Multi-Unit Structure
- Trailer/Mobile Home
- Boat, Tent, etc.

The address status and structure type help the LiMA determine the subsequent actions a FR must perform to validate the address.

Collect Address Information (Update/Verify the Address List)

For each living quarter, the FR reviews the location address information and updates as necessary. Each living quarter should have either a city-style address (house number and street name) or a location/physical description such as two-story ranch house with two-car garage. The LiMA provides standardized descriptions for structure characteristics that the FR may choose from to fill the location/physical description field. A location/physical description is only required when the FR cannot determine the house number and street name for the structure.

The FR also confirms or updates the mailing address in cases where the address on the list is not a USPS address⁵. The LiMA prompts the user to take this action when appropriate. To collect the mailing address, the FR must make contact with a knowledgeable person. If the FR makes contact, they collect either a city-style mailing address or a rural route-style mailing address.

⁵ The identification of non-USPS addresses is not made obvious to the FR. The LiMA uses the information provided by the MAF/TIGER System to guide the data collection path for the user.

Collect GQ Information (Update/Verify the Address List)

If the FR encounters a GQ address on the ground, they attempt to make contact with a manager or some other knowledgeable person to collect specific GQ information. This information includes:

- The GQ type.
- GQ name.
- Contact information for the manager or other knowledgeable person (includes name, title, phone number, email address, website and office location).
- Maximum capacity (e.g. number of beds).

The FR attempts to collect this information the first time they encounter the address. They will not make return visits to the block to find a knowledgeable person. If they are unable to make contact with someone the first time, they look for contact information posted on or near the building. Otherwise, they fill in the information to the best of their ability by observation alone.

Collect a Map Spot (Update/Verify the Address List)

A map spot indicates the general location of the living quarters on the ground. FRs must collect or verify the map spot for every structure that contains at least one living quarter. FRs stand at the primary entrance for the structure to collect the map spot. This is the preferred location; however, in cases where the GPS is not available, they may choose to stand at a secondary entrance, driveway, or pathway leading to the structure.

The FR collects the map spot in the LiMA by tapping or clicking on the map within the relative location of the structure or within the YAH! when GPS is available. When the FR collects the map spot, two sets of geographical coordinates are collected:

- The manual (or relative) coordinates where the FR tapped the screen.
- The GPS coordinates based on where the FR is standing.

During the map spot collection, the LiMA conducts a long strand test. That is, the LiMA compares the manual coordinate location to the GPS coordinates or some other location information available through Wi-Fi and the cellular network when GPS is not available. If the distance between the two data points is outside of an acceptable range, the LiMA warns the FR that they appear to be standing too far away from the location they want to map spot. The FR is not stopped from collecting coordinates at this location, as there may be a good reason to do so. Collecting or verifying a map spot is the final step in working or adding a particular address.

Resolve Unworked Addresses on the List (Update/Verify the Address List)

When FRs have traveled the entire block and arrived back at their starting point, they will resolve any addresses left on their list that they did not previously locate on the ground. The LiMA enables FRs to filter their address list based on a worked versus unworked status. The unworked addresses may have been missed during their canvass, or they may duplicate another address on their list, or the address may not exist in the block.

Mark Assignment as Complete

Once the FR has completed canvassing their assigned block, they indicate that all work is done by selecting the “block complete” button in the LiMA. The LiMA then conducts a series of checks to confirm all addresses in the block have been worked. All addresses should have an address status (and map spot when necessary). If not, the LiMA displays an error message, and the FR resolves the unworked addresses and then submits the block as complete again. If the check passes, the LiMA marks the block complete and the FR exits the LiMA.

Submit Results

The FR transmits their completed assignments in MCM. FRs may transmit at any time but should always transmit once they have finished work for the day. They transmit their work at the end of the day, even if they have not completed any block assignments. Based on the planned QC process, SMarCS receives only the completed blocks and determines the QC sample as described in Section 4.2.3.3 below. QC procedures were originally planned for implementation into the FY2018 MAFCS.

4.2.3.3 Conduct MAFCS Quality Control (QC) Support Activities [ADC 8-2.3.3]

Refer to [Figure 19](#) for a view of the activity that makes up the “Conduct MAFCS Quality Control (QC) Support Activities” operational subactivity.

The basic purpose of Quality Control (QC) is to ensure the quality of the collected data. To achieve this goal, the following objectives are implemented:

- Deter field staff from falsifying data.
- Identify field staff in need of additional training to correct behavior .
- Identify fieldwork that was erroneous and must be reworked.

The QC process for MAFCS was not in place for fiscal years 2016 and 2017 but was planned for implementation in FY 2018.

The planned MAFCS QC design uses an acceptance sampling methodology based on the Average Outgoing Quality Limit (AOQL). This method focuses on rectifying errors, and in the end assures that the error rate for the output data are lower than a specified AOQL value. The AOQL for all DAAL operations including the MAFCS is 10 percent. To meet this goal, the QC

is structured as a dependent field listing of a sample of the original FR's work. Field supervisors conduct the QC field listing. They review and correct the listing work as necessary with guidance from the LiMA (via SMarCS) as to the amount of review work required. At the completion of the QC listing, the original FR who completed the production listing receives feedback. Discussions in subsequent sections below provide more details for the QC assignment and listing processes.

Note that the QC design presented here is dependent on fieldwork. The Address Canvassing QC team originally planned to conduct research on alternative designs to determine how the quality control would be handled. Some items identified for research included using external sources to confirm data collected in the field, and collecting and analyzing paradata to help develop models, which could focus the QC sample on known problem areas. For more details on the design of the QC program, please refer to the *Address Canvassing Quality Control Detailed Business Proposal* (U.S. Census, 2015).

Assign MAFCS Field Data Collection QC Work

The QC fieldwork within MAFCS was not planned for implementation until FY2018. The planned process is detailed below.

Business Rules

The planned rules for determining the sample of QC review units are guided by the number of units required to measure the error in production for FRs based on their total number of completed units, as well as the proportion of deletes in the sample block. As the QC plan changes based on research activities, business rules could include criteria for comparisons to other source data which will further reduce the QC sample.

Send Results for QC Sampling via SMarCS

Once the FRs complete their production listings for MAFCS, along with listings for their other DAAL work, the SMarCS receives all of these completed listings.

Sample and Determine Need for In-Field QC Work

To determine if errors are within specified threshold, the completed production work is batched for each FR on a monthly basis in preparation for the sample selection. SMarCS then determines the number of sample units that are required for review based on the business rules described above. SMarCS will identify:

- The starting intersection where the FS, who is henceforth referred to as the QC FR, should start their listing.
- The remaining number of sample cases required, which are selected during the QC listing from the ground, in sequence (*i.e.*, specific units are not pre-identified).

- The proportion of production FR deletes in the sample block.

SMA RCS then sends that information to the In-Field workload management systems, and the work is assigned to a QC FR.

In the future, it may be the case that the QC design will allow for confirmation without fieldwork. If so, SMA RCS will determine the need for fieldwork per those business rules. If no further work is necessary, this information is conveyed back to the appropriate systems, and the production listing results are sent to MAF/TIGER. If further work is necessary, the listings are sent to workload management and assigned for QC work.

Perform MAFCS Field Data Collection QC Work – Start Full Recanvass (Planned for 2018)

Locate and Travel to Assignment

QC FRs receive QC assignments on their laptop via MCM. They will then locate and travel to the assignment to confirm the work of the original production FR. They will first locate the starting intersection identified in the LiMA.

Compare Ground to List and Update/Verify Address List

The QC FR then proceeds to perform the same tasks as the production FR as described in Section 4.2.3.2. The only difference is that the QC FR's address list and map reference data reflects the updates provided by the production FR.

At each address, the QC FR proceeds to conduct each of the following activities:

- Compare what is on the ground to the work of the production FR.
- Update and/or verifies the information in the address list.
- Collect GQ information when appropriate.

The QC FR completes these tasks for each address on the ground until the QC sample is complete, as guided by the LiMA. The QC FR will also work the necessary number of production deletes to fulfill the QC sample. They may work these deletes while they are working on their sample from the ground or they may work these deletes after their ground sample work is complete.

QC Sample Pass/Fail and Assignment Completion

As the QC FR completes their work, the LiMA keeps track of any corrections made and tallies the errors. If the production FR work passes—that is it did not exceed the number of allowable errors—then the QC assignment is complete. If the production work did not pass, then the QC FR begins a full recanvass of the production FR's work. They will again update and/or verify the

address list and maps and collect GQ information as required, continuing this process until they rework all of the addresses/features in the assigned blocks.

Submit Results

The completed work is then submitted back to headquarters. If QC work is not required, then the data are prepared and sent to the MAF/TIGER System. If QC is required, the production and QC results are adjudicated (via automated business rules) to identify the appropriate action for MAF update. For instance, if the production FR corrected the address information and the QC FR verified that information, the final action for MAF update is a correction action. Systems then send the final results to the MAF/TIGER System.

4.2.4 MAFCS Final Outputs [ADC 8-2.4]

Refer to [Figure 19](#) for a view of the activity that makes up the “MAFCS Final Outputs” operational subactivity.

The MAF/TIGER System will receive the results of the MAFCS (and in future years, as passed through QC). Those results contain updates for addresses on the MAF and features in TIGER. Once those results are processed through the MAF/TIGER System, as described in Section 5.2.4.1, update transaction files are created and delivered to DSSD for analysis.

4.2.4.1 Data for MAF/TIGER Updates [ADC 8-2.4.1]

The LiMA and MCM outputs are used to generate the following files for the MAF/TIGER System.

Address Update File

The ADDUP contains all of the original MAF units for the block as well as any units added during the fieldwork. The address information on each record reflects the final corrected or verified version. Each record also has the final address status, which determines what MAF updates are required.

Structure Update File

The Structure Update File contains all of the map spot information collected during the fieldwork. This includes the latitude and longitude coordinates, both the manual and GPS locations. The coordinate information on the Structure Update File is linked to the address information on the ADDUP through an identification number that is retained on both files. Addresses at the same coordinate location are assigned the same identification number.

Feature Update File

The Feature Updates Table contains information for all road features that were updated during the fieldwork. Currently, the only outputs for this table are road name changes.

4.2.4.2 Data for Analysis [ADC 8-2.4.2]

The MAFCS requires results files in order to produce the MAF coverage estimates, as well as to report on the overall results of the production and QC listings. To support this effort, DSSD and GEO receive output data from the LiMA as well as transaction files from the MAF/TIGER System.

MAF Update Transaction File

The MAF Update Transaction File is an address level file that contains the results of the MAF Update process. The file provides:

- The final action applied to the MAF for each address record that existed prior to the fieldwork.
- The new MAF identification number⁶ (MAFID) for the addresses added during the fieldwork.
- The duplicate linkages, as identified during the fieldwork or during the match to the MAF.

Production and QC Analysis Files

The production and QC analysis files contain the raw data from the production and QC listing as well as any paradata.

4.2.5 MAFCS Estimation and Analysis [ADC 8-2.5]

Refer to [Figure 19](#) for a view of the activity that makes up the “MAFCS Estimation and Analysis” operational subactivity.

The outcomes from the field data collection are the basis for the final MAF coverage estimates.

The MAF Coverage Study includes the following analysis questions.

1. What are the estimates of good addresses on the MAF?
2. What are the estimates of (total, new and matched) adds?
3. What are the estimates of overcoverage and undercoverage on the MAF?

Overcoverage is indicated by the weighted count of addresses in sample blocks that through fieldwork are marked as deletes, duplicates, or nonresidential; and addresses in sample blocks that are changed or moved out of a sample block. Undercoverage is indicated by the weighted

⁶ The MAFID represents a nine-digit numeric identifier that uniquely distinguishes one unit on the MAF from all others.

count of addresses in sample blocks that are added by MAFCS fieldwork and not matched to the MAF. Estimates for the above questions are produced at the following levels:

- United States total (50 states and the District of Columbia).
- Puerto Rico (beginning in FY2018).
- Sub-national (central city, exurban, suburban, small town, rural).
- American Indian reservation (on, not on).
- In-Office Address Canvassing IR result (Active, Passive, On Hold, not processed).
- GSS partner area (in, not in).
- 2010 Type of Enumeration Area.

The annual MAF Coverage Study planned to address the following research questions.

- (1) How does In-Office Address Canvassing work compare to the MAFCS fieldwork?
 - a. How well does In-Office Address Canvassing-IR classify blocks as Active or Passive as compared to results from MAFCS fieldwork? Do Passive blocks have adds and deletes found in the field?
 - b. Does the In-Office Address Canvassing-ABR identify the same adds, deletes, and changes as the MAFCS Field Representatives?
- (2) How accurate is MAFCS geocoding? MAFCS geocodes can be compared to In-Office Address Canvassing-ABR geocodes to determine if there is agreement between the two operations.
- (3) Do addresses that are deleted in the field for MAFCS exist on the US Postal Service Delivery Sequence File (DSF) as Nonresidential or Excluded from Delivery Statistics (EDS) addresses? This research question will help to inform how the DSF is used to identify the universe of “good” address records.

Analysis for the 2016 MAFCS included a detailed inspection conducted by GEO on a subset of MAFCS sample blocks to evaluate field actions in blocks classified by IR as Passive.

Researchers in GEO used the compiled data and additional source information to assign various codes to the add, delete, and duplicate field actions within Passive blocks. Specifically, researchers assigned 1) field action codes to provide details about the quality and nature of the field action; 2) coverage codes to indicate whether the field action appeared to improve MAF coverage, introduce coverage risk, or have no impact on coverage; and 3) IR codes (where appropriate) to document the reason that IR did not identify the coverage issue for actions that improve coverage. This information was designed to give additional context to the Research Questions.

5 In-Field Address Canvassing [ADC 8-3]

This section describes the details of how the In-Field Address Canvassing [ADC 8-3] will be conducted in the 2020 Census. An overview of the activity is presented followed by detailed process descriptions using Business Process Model and Notation (BPMN) to depict the steps in the activity and the key information flows. Refer to the Activity Tree in Appendix C for a list of all of the major operational activities and subactivities associated with the ADC operation.

5.1 Design Overview

In-Field Address Canvassing [ADC 8-3] is the process of having field staff visit specific geographic areas to identify every place where people could live or stay. Field staff compare what they see on the ground to the existing census address list and either verify or correct the address and location information on the list. For the most part the details for how to conduct the In-Field Address Canvassing work are the same as what is described in the MAFCS section of this document. However, there are specific details unique to the In-Field Address Canvassing that will be conducted beginning in August of 2019. Those differences are explained in the sections that follow. Differences at a high level include:

- Listers canvass using collection geography (BCUs) instead of tabulation blocks (tested in the Address Canvassing Test).
- Listers are instructed to knock on every door to verify address information, collect associated mailing address information when prompted, and collect information about any additional housing units present at the address (MAFCS FRs are not instructed to knock on every door).
- Listers are supervised and work out of an area census office (ACO) rather than a regional office (RO).

In-Field Address Canvassing encompasses several activities starting in August of 2019. This activity consists of 4 subactivities:

- In-Field Address Canvassing Data Inputs [ADC 8-3.1]
- In-Field Address Canvassing Staffing Needs [ADC 8-3.2]
- In-Field Address Canvassing Fieldwork [ADC 8-3.3]
- In-Field Address Canvassing Final Outputs [ADC 8-3.4]

5.2 Detailed Process Description

Figure 20 is a top-level BPM diagram showing the In-Field Address Canvassing operational activity [ADC 8-3] (area within the gray rounded rectangle) and its constituent activities within the overall context of the ADC operation.

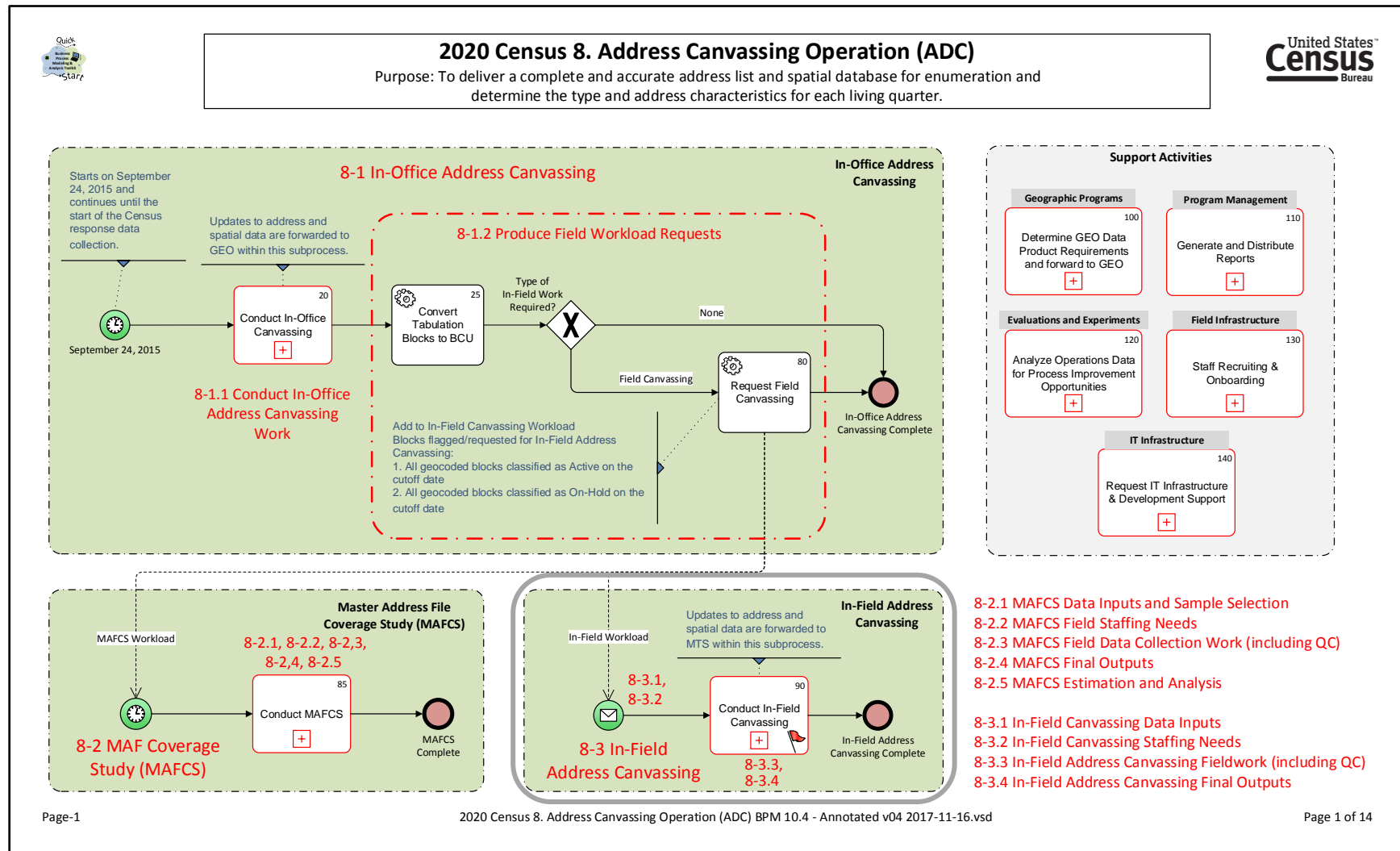


Figure 20: In-Field Address Canvassing [ADC 8-3] within Top-Level ADC Context Model

The In-Field Address Canvassing Operational Activity [ADC 8-3] is subdivided into the following Activity Areas:

- In-Field Address Canvassing Data Inputs [ADC 8-3.1]
- In-Field Address Canvassing Staffing Needs [ADC 8-3.2]
- In-Field Address Canvassing Fieldwork [ADC 8-3.3]
- In-Field Address Canvassing Final Outputs [ADC 8-3.4]

Subsequent sections describe the In-Field Address Canvassing Operational Activity in detail.

5.2.1 In-Field Address Canvassing Data Inputs [ADC 8-3.1]

Refer to [Figure 20](#) for a view of the activity that makes up the “In-Field Address Canvassing Data Inputs” operational subactivity.

In addition to the address and spatial data inputs described in Section 2.3.2, In-Field Address Canvassing requires the workload to be created as part of the In-Office Address Canvassing processes.

Field Area Delineation

The In-Field Address Canvassing will collect data within the confines of a BCU, a different geography from the In-Office Address Canvassing operation (which uses tabulation blocks). A block to BCU crosswalk was developed to ensure all blocks are assigned to a corresponding BCU. This data is produced by Geographic Programs and is provided during listing operations as a Geographic Reference File that is accessible in the LiMA.

In-Field Workload

The In-Field workload is determined by the recommendation from the In-Office Address Canvassing and the final stakeholder decision-making processes. Once the final universe of In-Field blocks is identified, FLD will use the information to recruit and hire field staff in advance of the production start date. The MAF/TIGER System will create assignment files that are provided to the In-Field data collection control systems. Current workload estimates are presented in Section 2.5.3.

5.2.2 In-Field Address Canvassing Staffing Needs [ADC 8-3.2]

Refer to [Figure 20](#) for a view of the activity that makes up the “In-Field Address Canvassing Staffing Needs” operational subactivity.

The Field Infrastructure operation (FLDI) will be responsible for general field operations recruiting, onboarding and training activities (including support for ADC In-Field Address

Canvassing work). The ADC operation will be responsible for providing the Address Canvassing specific training content needed for ADC In-Field Address Canvassing work.

5.2.2.1 In-Field Address Canvassing Staff Estimation [ADC 8-3.2.1]

In-Field Address Canvassing staff estimation is based on workload generated by the Produce Field Workload Requests [ADC 8-1.2] activity after the cut-off date when all In-Office Address Canvassing work must stop in order to allow time for final In-Field Address Canvassing determinations. Staff estimation is based on the estimated number of housing units that will be field canvassed by geographic area. This information is used by the Field Infrastructure operation (FLDI) to create a model for estimating the staffing needs by location.

5.2.2.2 In-Field Address Canvassing Staff Training/Onboarding Support [ADC 8-3.2.2]

The ADC operation conducts the ADC-specific training for its field staff. A mixture of automated and classroom training will be used to prepare all staff for their roles in the operation. Staff will spend one day in face-to-face classroom training, and will then train using Learning Management Systems (LMS) and complete independent study modules prior to a final day of face-to-face meetings to receive needed materials, complete a field exercise, and ensure readiness for the field. CFS trainees complete an additional day of classroom training. This approach limits classroom time but will still provide ready-to-work listers.

The training modules developed for the DAAL program served as the initial baseline for automated training materials that were used in preparation for the Address Canvassing Test. These materials were updated for the Address Canvassing operation of the 2018 End-to-End Census Test and will again be updated for In-Field Address Canvassing for the 2020 Census.

The Decennial Logistics Management operation (DLM) develops and provides kits to support field staff.

The Decennial Service Center operation (DSC) supports all 2020 Census field operations and handles all service requests initiated by field staff. Services include:

- Password resets.
- Resolution of software and hardware issues.
- Security incident management.
- Communications to and from field offices to address such issues as outages and software releases.

The description of this support will be provided in the DSC Detailed Operational Plan.

5.2.3 In-Field Address Canvassing Fieldwork (including QC) [ADC 8-3.3]

Conducting the In-Field Address Canvassing Fieldwork activity involves the following operational subactivities:

- Managing the In-Field Address Canvassing Work [ADC 8-3.3.1]
- Performing the In-Field Address Canvassing Work [ADC 8-3.3.2]
- Conduct In-Field Address Canvassing Quality Control (QC) Support Activities [ADC 8-3.3.3]

A detailed view of the constituent activities that make up the In-Field Address Canvassing Fieldwork operational activity is given in Figure 21 below.

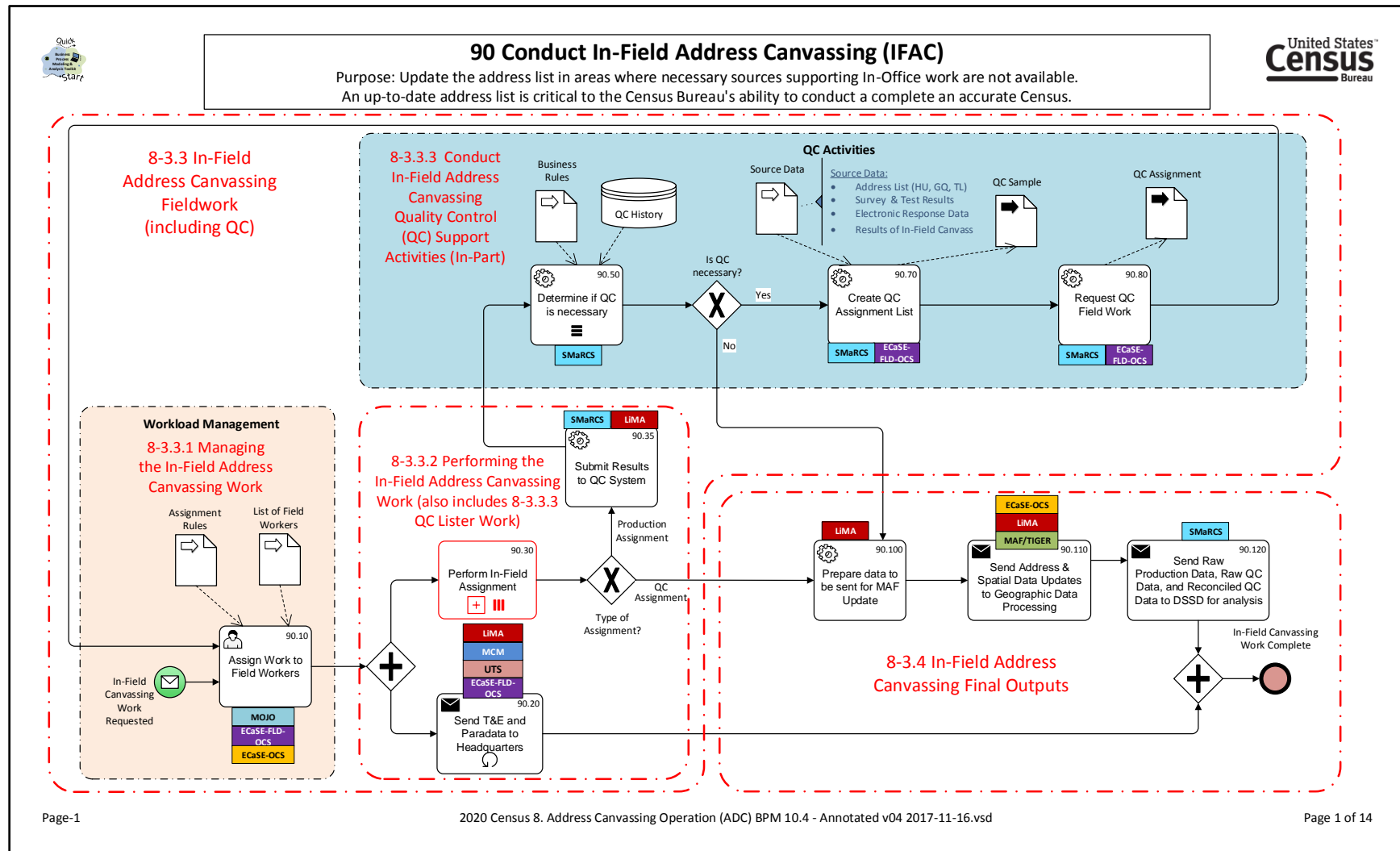


Figure 21: In-Field Address Canvassing Fieldwork (including QC) Constituent Activities

5.2.3.1 Managing the In-Field Addressing Canvassing Work [ADC 8-3.3.1]

Refer to Figure 21 for a view of the activity that makes up the “Managing the In-Field Address Canvassing Work” operational subactivity.

Assignments

Assignments will be provided to the listers via MCM from FOCS. Workloads are assigned in FOCS after they have been run through the MOJO Optimizer system to ensure assignments are geographically optimized based on lister locations and blocks that need to be worked. These assignments will exist on their mobile device in the MCM. They will use applications on the device to update the address list and maps within each assignment, as well as to submit time and expenses.

Monitoring and Reporting

CFSs will have progress and status information available to them within FOCS, by use of a mobile device, for their assigned listers. The CFSs will provide support to listers and will use the mobile device to approve lister timesheets and capture lister interaction data (e.g., lister John Doe called to report his car is broken down and he is not working today). Management alerts are also provided through MOJO for issues that may require attention (e.g., blocks that have not been completed or worked for an extended period of time by a lister).

Workload progress within FOCS will be monitored by the CFMs. They will use dashboard summaries and key performance indicators to understand areas of concern and move resources as needed. CFMs will use information provided by FOCS and local knowledge to make decisions on when to onboard/off-board listers/CFSs as fieldwork progresses. Their work in conjunction with other CFMs in their assigned areas will ensure completion of all work for their entire area.

5.2.3.2 Performing the In-Field Address Canvassing Work [ADC 8-3.3.2]

A detailed view of the constituent activities that make up the “Performing the In-Field Address Canvassing Work” operational activity is given in Figure 21 above and Figure 22 below.

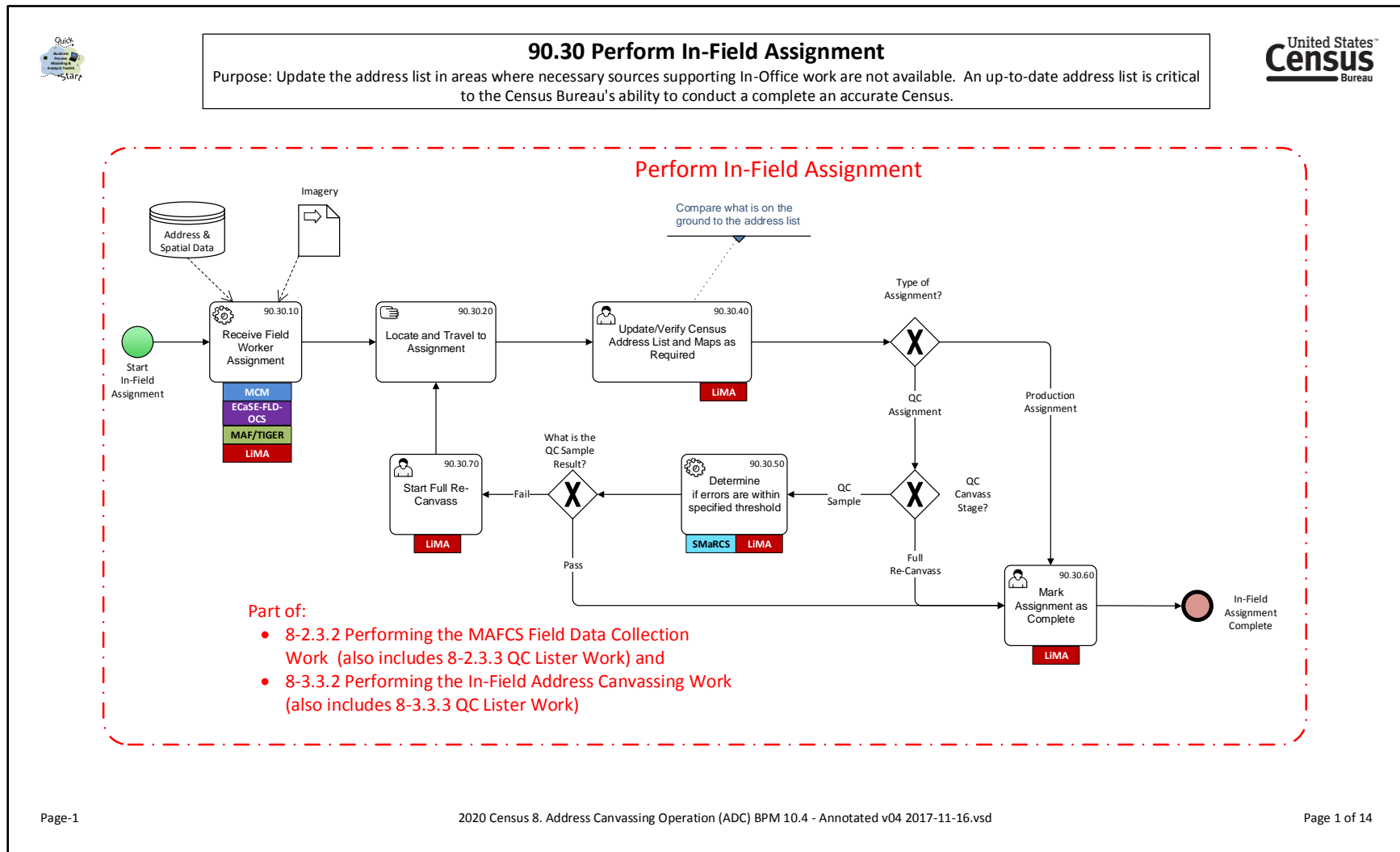


Figure 22: Performing the In-Field Address Canvassing Work

To perform the In-Field Address Canvassing work, listers canvass assigned BCUs with their mobile devices. The data collection occurs within the LiMA. The 2020 Census In-Field Address Canvassing will use full BCU canvassing methods to collect specific address and living quarters information.

For the most part, the In-Field Address Canvass is comprised of the same general steps outlined for the MAF Coverage Study field data collection in Section 4.2.3.2. At a high level:

- The lister receives assignments in MCM from the FOCS and prepares for work.
- The lister locates and travels to an assignment and compares what is on the ground to the LiMA address list. The lister attempts to contact a knowledgeable person to verify address information (unlike MAFCS/DAAL, which does not necessarily require an attempted contact with a knowledgeable person).
- If a map update is required, the lister updates the LiMA map as required (updates street names and collects mapspots). If there is a GQ or TL address, the lister also collects GQ/TL information.
- The lister marks the assignment as complete, submits the results and does the next assignment.

Imagery

Aerial imagery will be available as a layer in the LiMA map view to assist listers with their work. Listers will toggle the information on and off as needed, comparing what they see on the ground to the image in order to orient themselves and identify living quarters missing from the list.

5.2.3.3 Conduct In-Field Address Canvassing Quality Control (QC) Support Activities [ADC 8-3.3.3]

Constituent Activities

A detailed view of the constituent activities that make up the “In-Field Address Canvassing Quality Control (QC)” operational activity is given in Figure 21.

The overall process at a high level includes:

- Assign In-Field Address Canvassing QC work.
- The SMarCS will sample and determine the need for In-Field QC work.

- The QC lister receives the assignment in MCM from the operational control system and prepares for work.
- Perform In-Field Address Canvassing QC work.
- The QC lister (who must be different from the original person who listed the block) locates and travels to an assignment and compares what is on the ground to the LiMA address list. They will begin canvassing at the starting intersection indicated in the LiMA.
- The QC lister will validate or update the address list as needed until they complete their QC sample. They will also work the sample of deletes identified in the LiMA. In cases where the QC sample fails, the QC lister will rework the remainder of the block, including all remaining living quarters within the block/BCU.
- The QC lister marks the assignment as complete (if recanvassing; this step is done automatically if a recanvass is not needed), submits the results, and does the next assignment until no more assignments exist.

Additional detail about the QC process is presented in the *2018 End-to-End Census Test In-Field Address Canvassing Quality Assurance Plan* (U.S. Census Bureau, 2017b).

5.2.4 In-Field Address Canvassing Final Outputs [ADC 8-3.4]

The In-Field Address Canvassing Final Outputs operational subactivity is subdivided into the following constituent activities.

- Data for MAF/TIGER Updates [ADC 8-3.4.1]
- Data for Analysis [ADC 8-3.4.2]

A detailed view of the constituent activities that make up the In-Field Address Canvassing Final Outputs operational activity is given in Figure 21.

5.2.4.1 Data for MAF/TIGER Updates [ADC 8-3.4.1]

The final outputs sent to the MAF/TIGER System are the Address Update File (ADDUP), Structure File, and Feature Update File, as described in Section 4.2.4.1. Structure files are used to update mapspot locations and feature files are used to update feature data in MAF/TIGER.

At a high level, MAF update steps used by both the MAFCS and In-Field Address Canvassing fieldwork include:

- Data files are received from the field operation or customer

- The file is converted to an ADDUP, if not already provided in that format.
- Pre-processing steps are run to identify data errors on the ADDUP and reject records prior to updating the MAF.
- Records are matched to the MAF (via the MAFID and/or address) and assigned a transaction case number that identifies the type of MAF update (or reject) that will occur.
- The MAF is updated according to the transaction case.
- Results, including rejects, are made available to GEO staff and customers.

5.2.4.2 Data for Analysis [ADC 8-3.4.2]

LiMA, MCM, and FOCS systems will create data files for Address Canvassing assessments. To support analysis, output data from LiMA and transaction files from the MAF/TIGER System are produced.

MAF Update Transaction File

The MAF Update Transaction File is an address level file that contains the results of the MAF Update process. The file provides:

- The final action applied to the MAF for each address record that existed prior to the fieldwork.
- The new MAFID for the addresses added during the fieldwork.
- The duplicate linkages, as identified during the fieldwork or during the match to the MAF.

Production and QC Analysis Files

The production and QC analysis files contain the raw data from the production and QC listing as well as any paradata.

6 Cost Factors

6.1 Background

Investment in Address Canvassing is projected to reduce ↓ the 2020 Census overall costs in the following ways:

- ↓ Reduction in the amount of In-Field Address Canvassing and associated infrastructure by implementing In-Office Address Canvassing.
- ↓ Use of additional sources of administrative records and third-party data to validate the frame.

In addition:

↑ Address Canvassing is expected to require additional people, process activities, data, technology, and facilities to support In-Office Address Canvassing, including the resolution of ungeocoded addresses, review of GQ and TL addresses, and validation of LUCA submissions.

6.2 Cost Factors

A list of major cost factors related to the ADC operation includes the following:

For In-Office Address Canvassing:

- Number of people.
- Staff productivity.
- Staff wages.
- Size of office space required.
- Cost of third-party data.
- Special equipment needs.

For In-Field Address Canvassing:

- In-Field ADC Workload.
- Geographic Dispersion of workload (impacts number and location of offices)
- Field staff:
 - Frontload rate.
 - Replacement training rate.
 - Duration of production activities.
 - Productivity (cases/hour).
 - Miles traveled per block.
 - Supervisor to lister ratio.
 - Mileage reimbursement rate.
 - Staff wage - Production.

- Staff wage – Training.

For MAF Coverage Study:

MAFCS costs factors are similar to In-Field ADC cost factors.

6.3 Relevant IDEF0 Mechanisms

The following mechanisms from the IDEF0 Context Diagram represent the resources used to support this operation and will therefore impact its cost:

Staff

- HQ Staff.
- NPC Staff.
- RO Staff.
- RCC Staff.
- ACO Staff.
- Field Staff.

Sites

- HQ.
- NPC.
- RO.
- RCC.
- ACO.
- Field Area.
- Training Venues.

Systems

- BARCA.
- CDL.
- DAD.
- ECaSE FOCS.
- ECaSE SOCS.
- GeoSpatial Services.
- LiMA.
- MaCS.
- MAF/TIGER.
- MCM.

- MOJO Route Optimizer.
- ROSCO.
- SOA.
- SMarCS.
- UTS.
- Other Supporting Systems.

Other

- Mobile Devices.
- Kits/Supplies.
- Broadband Networks.

7 Measures of Success

For the 2020 Census operations, the corresponding Measures of Success will be documented in the operational assessment study plans and final reports. The operational assessment study plan documents the criteria that will be used to define successful completion of the operation. The operational assessment report will provide results on whether the criteria were met.

In general, operational assessments report on planned to actual variances in budget, schedules, and production and training workloads. The corresponding Measures of Success (as documented in the operational assessment study plan) include variances that exceed established thresholds. See *Content Guidelines for the 2020 Census Operational Assessments* for the potential scope of assessment.

Types of success measures include:

- **Process Measures** that indicate how well the process works, typically including measures related to completion dates, rates, and productivity rates.
- **Cost Measures** that drive the cost of the operation and comparisons of actual costs to planned budgets. Costs can include workload as well as different types of resource costs.
- **Measures of the Quality** of the results of the operation, typically including things such as rework rates, error rates, and coverage rates.

See the corresponding operational assessment study plan and report for the Address Canvassing Operation (ADC) for details on the measures of success.

Appendix A – Acronyms and Terminology

Table 9 lists the acronyms and abbreviations used within this Address Canvassing Detailed Operational Plan document.

Table 10 lists a Glossary of Terms used within this Address Canvassing Detailed Operational Plan document.

Table 9: Acronyms and Abbreviations List

Acronym	Meaning
ABR	Active Block Resolution
ACS	American Community Survey
ACO	Area Census Office
ACOM	Area Census Office Manager
ADC	Address Canvassing operation
ADDUP	Address Update File
ADSD	Application Development and Services Division
ARC	Archiving operation
ASE	Address Source Evaluation
BARCA	Block [or BCU] Assessment, Research and Classification Application
BCU	Basic Collection Unit
BLM	Bureau of Land Management
BTD	Block [or BCU] Tracking Database
BQARP	Boundary, Quality Assessment and Reconciliation Project
CARRA	Center for Administrative Records Research and Applications
CASS	Coding Accuracy Support System
CAUS	Community Address Update System
CDL	Census Data Lake
CEDCaP	Census Enterprise Data Collection and Processing
CFM	Census Field Manager
CFS	Census Field Supervisor
CHEC	Census Hiring and Employment Check
CPS	Current Population Survey

Acronym	Meaning
CRO	Count Review operation
CUF	Census Unedited File
DAD	Dangerous Address Database
DAPPS	Decennial Personnel and Payroll System
DAAL	Demographic Area Address Listing
DCMD	Decennial Census Management Division
DITD	Decennial Information Technology Division
DLM	Decennial Logistics Management operation
DOD	Department of Defense
DPD	Data Products and Dissemination operation
DSC	Decennial Service Center operation
DSF	Delivery Sequence File
DSSD	Decennial Statistical Studies Division
ECaSE	Enterprise Census and Surveys Enabling Platform
ENS	Emergency Notification System
ETL	Enumeration at Transitory Locations operation
FSCPE	Federal State Cooperative Program for Population Estimates
FLD	Field Division
FLDI	Field Infrastructure operation
FMA	Field Management Area
FOCS	Field Operational Control System
FR	Field Representative
FS	Field Supervisor
FY	Fiscal Year
GATRES	Geographic Acquis-based Topological Real-time Editing System
GEO	Geography Division

Acronym	Meaning
GEOP/GD	Geographic Programs operation: Geographic Delineations
GEOP/GDP	Geographic Programs operation: Geographic Data Processing
GEOP/GP	Geographic Programs operation: Geographic Partnerships
GIS	Geographic Information System
GQ	Group Quarter
GQV	Group Quarters Validation
GRF	Geographic Reference File
GSS	Geographic Support System Initiative
GWCS	GSS Workflow Control System
HU	Housing Unit
IFAC	In-Field Address Canvassing
IOAC	In-Office Address Canvassing
IPT	Integrated Project Team
IR	Interactive Review
IT	Information Technology
LACS	Locatable Address Conversion System
LiMA	Listing and Mapping Application
LMS	Learning Management System
LUCA	Local Update of Census Addresses
MaCS	Matching and Coding Software
MAF	Master Address File
MAFCS	Master Address File Coverage Study
MAFID	Master Address File Identification Number
MCM	Mobile Case Management
MCS	Master Control System
MSP	MAF Structure Point

Acronym	Meaning
MTAG	MAF/TIGER Address Geocoding Application
MTS	MAF/TIGER System
NHIS	National Health Interview Survey
NPC	National Processing Center
NRFU	Nonresponse Followup operation
OCS	Operational Control System
OMB	Office of Management and Budget
PBC	Partial Block Canvassing
PES	Post-Enumeration Survey
QC	Quality Control
QI	Quality Indicators
RCC	Regional Census Center
RDP	Redistricting Data Program operation
RO	Regional Office
ROSCO	Regional Office Survey Control System
SBE	Service-Based Enumeration
SCIF	Sample Control Input File
SIPP	Survey of Income and Program
SMaRCS	Sampling, Matching, Review and Coding System
SPC	Security, Privacy, and Confidentiality operation
TAC	Technical Assistance Center
TEA	Type of Enumeration Area
TIGER	Topologically Integrated Geographic Encoding and Referencing System
TL	Transitory Location
TOI	Time of Interview
UE	Update Enumeration operation

Acronym	Meaning
UL	Update Leave operation
UR	Ungeocoded Resolution
USPS	United States Postal Service
UTS	Unified Tracking System
WBT	Web-based training
YAH	You are Here Indicator
ZCTA	ZIP Code Tabulation Area
ZIP	Zone Improvement Plan

Table 10: Glossary of Terms

Term	Meaning
Active Block Resolution (ABR)	The ABR is a phase of the In-Office Address Canvassing operation where Census Bureau staff research blocks that have identified growth, decline, undercoverage, or overcoverage as identified by the Interactive Review phase of the In-Office Address Canvassing. The ABR attempts to resolve these issues and update the MAF/TIGER System as appropriate. Otherwise, ABR may identify the block as a candidate for fieldwork. This process was completed for about 85,000 blocks nationally before it was discontinued in February of 2017. After the ABR operation was stopped, the updated reengineered Address Canvassing operation was designed to assign blocks to In-Field Address Canvassing based on block or address status after review by other In-Office Address Canvassing processes.
Block	A geographic area bounded on all sides by visible features such as roads, railroad tracks, and rivers or by invisible features, such as a county line, city limits, or a property line.
Basic Collection Unit	The BCU is a new unit of geography, designed for field data collection in the 2020 Census. It serves as the smallest unit of collection geography for all 2020 Census listing-based operations. BCU would serve as the fundamental unit of work assignment for 2020 Census operations.
City-Style Address	An address that consists of a house number and street or road name, for example, 101 Main Street.
Community Address Update System (CAUS)	A system to improve the Address Frame used for ACS sampling where less (or no) coverage from USPS DSF exists.
Demographic Area Address Listing (DAAL)	A listing operation conducted to update the Census Bureau's address lists and maps.
Geocode	A code used to identify a specific geographic entity.
Geocoding	The assignment of an address, structure, key geographic location, or business name to a location that is identified by one or more geographic codes.

Term	Meaning
Group Quarters	Group Quarters are places where people live or stay, in a group living arrangement, which is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other.
Group Quarters Facility Name	The name of the larger facility in which a group quarter may be found. For example, the name of a college or university.
Housing Unit	A house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as a separate living quarters. A housing unit must have direct access from the outside or through a common hall.
Interactive Review	Interactive Review is part of the In-Office Address Canvassing operation, in which Census Bureau staff compare two vintages of imagery (2009 and current) as well as MAF counts to identify areas of growth, decline, MAF undercoverage, or MAF overcoverage.
Lister	A Census Bureau field representative who travels along streets and roads to look for living quarters and updates the census address list.
Living Quarters	A place where persons either live or stay or could live or stay and are classified as either a housing unit or group quarter. Living quarters may be occupied or vacant.
Location Address	An address used to find a living quarter on the ground.
Location/Physical Description	A short description of the location and physical characteristics of the structure that tend not to change such as building material (e.g., brick, stone), housing style, garages, porches, and so on used to help others find the structure.
Mailing Address	The address to which the United States Postal Service delivers mail.
Map spot	A symbol on the map representing the location of a structure that contains one or more living quarters.

Term	Meaning
Nonresponse Followup	A census operation that serves two purposes: <ul style="list-style-type: none"> • Determine housing unit status for nonresponding addresses • Enumerate housing units for which a 2020 Census response was not received
Overcoverage	Overcoverage occurs in address frames when the frame contains more than enough records. This primarily results from two situations: there are records in the address frame that do not exist; or duplicate or multiple records in the frame target the same living quarter.
Paradata	Data that describes the way the raw data was collected. For example, the amount of time a lister spent entering the address information in the data collection instrument.
Quality Control	Quality Control is the set of activities that evaluates the quality of results based off of quality requirements and identifies ways to eliminate the causes of unsatisfactory results.
Service-Based Enumeration (SBE)	An operation designed to enumerate people at facilities where they might receive services, such as shelters, soup kitchens, healthcare facilities, and other selected locations. This operation targets the types of services that primarily serve people who have no usual residence.
Tract	A small, relatively permanent statistical subdivision of a county for the purpose of presenting data. Census tracts nest within counties, and their boundaries normally follow visible features, but may follow legal geography boundaries and other non-visible features in some instances. Census tracts ideally contain about 4,000 people and 1,600 housing units.
Transitory Location	Transitory Locations are recreational vehicle parks, campgrounds, hotels, motels, marinas, racetracks, circuses, and carnivals.
Undercoverage	Undercoverage in the address frame occurs when an address is not represented (i.e. missing) on the frame. Undercoverage is the most serious type of coverage error because it can be difficult to detect and even more difficult to solve.
Wi-Fi	A local area wireless computer networking technology that allows electronic devices to network.

Term	Meaning
You are Here Indicator	A symbol on the map used to indicate where you are on the ground. The location is determined by a GPS imbedded in the mobile device.

Appendix B – References

Appendix B lists the documents or other resources used during the development of this Detailed Operational Plan document.

Address List Operations Implementation Team, “2010 Census Address Canvassing Operational Assessment,” U.S. Census Bureau, January 12, 2012.

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U.S. Census Bureau (2017), “2020 Census Operational Plan,” Version 3.0, October 27, 2017.

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Appendix C – Activity Tree for Address Canvassing (ADC) Operation

This appendix presents the Activity Tree for the ADC Operation. An Activity Tree uses an outline structure to reflect the decomposition of the major operational activities in the operation. Each activity is numbered according to its position in the outline. For example, for the current operation numbered “8,” the first activity would be numbered 8-1. Subactivities under this activity would be numbered sequentially, starting again with the number one. For example, the first subactivity under the first activity would be numbered 8-1.1 the second subactivity as 8-1.2. The second activity would be numbered 8-2, and so on.

ADC Operation Activity Tree

8-1 In-Office Address Canvassing

- 8-1.1 Conduct In-Office Address Canvassing Work
 - 8-1.1.1 In-Office Address Canvassing Universe Creation
 - 8-1.1.2 Interactive Review (IR)
 - 8-1.1.2.1 Prioritizing the IR Work
 - 8-1.1.2.2 Managing the IR Work
 - 8-1.1.2.3 Performing the IR Work
 - 8-1.1.2.4 IR Quality Control
 - 8-1.1.2.5 IR Outputs
 - 8-1.1.3 Active Block Resolution (ABR)
 - 8-1.1.3.1 Prioritizing the ABR Work
 - 8-1.1.3.2 Managing the ABR Work
 - 8-1.1.3.3 Performing the ABR Work
 - 8-1.1.3.4 ABR Quality Control
 - 8-1.1.3.5 ABR Outputs
 - 8-1.1.3.5.1 Block Status
 - 8-1.1.3.5.2 Data for MAF Update
 - 8-1.1.4 Change Monitoring (Triggers)
 - 8-1.1.5 In-Field Canvassing Decision
 - 8-1.1.5.1 Cut-Off Date
 - 8-1.1.5.2 Decision Rules
 - 8-1.1.6 Ungeocoded Resolution (UR)
 - 8-1.1.6.1 Prioritizing the UR Work
 - 8-1.1.6.2 Managing the UR Work
 - 8-1.1.6.3 Performing the UR Work
 - 8-1.1.6.4 UR Quality Control
 - 8-1.1.7 In-Office Address Canvassing Group Quarters/Transitory Locations
 - 8-1.1.7.1 Prioritizing the In-Office Address Canvassing Group Quarters/Transitory Locations Work

- 8-1.1.7.2 Managing the In-Office Address Canvassing Group Quarters/Transitory Locations Work
 - 8-1.1.7.3 Performing the In-Office Address Canvassing Group Quarters/Transitory Locations Work
- 8-1.1.8 LUCA Address Validation
 - 8-1.1.8.1 Prioritizing the LUCA Address Validation Work
 - 8-1.1.8.2 Managing the LUCA Address Validation Work
 - 8-1.1.8.3 Performing the LUCA Address Validation Work
- 8-1.2 Produce Field Workload Requests

8-2 MAF Coverage Study (MAFCS)

- 8-2.1 MAFCS Data Inputs and Sample Selection
 - 8-2.1.1 MAFCS Sample Selection
 - 8-2.1.2 MAFCS Control File Creation
- 8-2.2 MAFCS Field Staffing Needs
 - 8-2.2.1 MAFCS Field Staff Estimation
 - 8-2.2.2 MAFCS Field Staff Recruiting and Hiring (via Regions)
 - 8-2.2.3 MAFCS Field Staff Training Support
- 8-2.3 MAFCS Field Data Collection Work (including QC)
 - 8-2.3.1 Managing the MAFCS Field Data Collection Work
 - 8-2.3.2 Performing the MAFCS Field Data Collection Work
 - 8-2.3.3 Conduct MAFCS Quality Control (QC) Support Activities
- 8-2.4 MAFCS Final Outputs
 - 8-2.4.1 Data for MAF/TIGER Updates
 - 8-2.4.2 Data for Analysis
- 8-2.5 MAFCS Estimation and Analysis

8-3 In-Field Address Canvassing

- 8-3.1 In-Field Address Canvassing Data Inputs
- 8-3.2 In-Field Address Canvassing Staffing Needs
 - 8-3.2.1 In-Field Address Canvassing Staff Estimation
 - 8-3.2.2 In-Field Address Canvassing Staff Training/Onboarding Support
- 8-3.3 In-Field Address Canvassing Fieldwork (including QC)
 - 8-3.3.1 Managing the In-Field Address Canvassing Work
 - 8-3.3.2 Performing the In-Field Address Canvassing Work
 - 8-3.3.3 Conduct In-Field Address Canvassing Quality Control (QC) Support Activities
- 8-3.4 In-Field Address Canvassing Final Outputs
 - 8-3.4.1 Data for MAF/TIGER Updates
 - 8-3.4.2 Data for Analysis

Appendix D – In-Field Address Canvassing Status Codes

Table 11 lists the In-Field Address Canvassing Status Codes planned for the 2020 Census.

Table 11: In-Field Address Canvassing Status Codes

Status	Meaning
Housing Unit	The living quarters is a house, an apartment, a mobile home or trailer
Uninhabitable Housing Unit	The housing unit is either vacant, open to the elements, condemned, or burned out, and because of these conditions is unfit for habitation
Group Quarters	The living quarters is a residence where people share common facilities or receive authorized care or custody
Uninhabitable Group Quarters	The group quarters is vacant, open to the elements, condemned, or burned out, and because of these conditions is unfit for habitation
Empty Trailer Pad/Mobile Home Site	The location is an empty trailer pad or mobile home site in a trailer park or mobile home community
Under Construction	The address is undergoing construction
Nonresidential	The address is solely used for business purposes
Duplicate	The address describes the same living quarters as another address on the list
Does Not Exist	The address on the list cannot be located in the block or in a nearby fringe area
Exists in the Fringe	The address is not located in the block, but it is in an adjacent block within the fringe area
Unable to Work	The address cannot be confirmed because access to the block or parts of the block is limited due to a dangerous situation, or natural or manmade barriers

Appendix E – 2020 Census Group Quarters Type Codes

This appendix lists the In-Field Address Canvassing Status Codes planned for the 2020 Census.

Table 12: 2020 Census Group Quarters Type Codes

Group Quarters	
<p>A group quarters is a place where people live or stay in a group living arrangement that is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers’ dormitories.</p>	
101	<p>Federal Detention Centers</p> <p>Stand alone, generally multilevel, federally operated correctional facilities that provide “short-term” confinement or custody of adults pending adjudication or sentencing. These facilities may hold pretrial detainees, holdovers, sentenced offenders, and Immigration and Customs Enforcement (ICE) inmates, formerly called Immigration and Naturalization Service (INS) inmates. These facilities include: Metropolitan Correctional Centers (MCCs), Metropolitan Detention Centers (MDCs), Federal Detention Centers (FDCs), Bureau of Indian Affairs Detention Centers, ICE Service Processing Centers, and ICE contract detention facilities.</p>
102 103	<p>Federal Prisons State Prisons</p> <p>Adult correctional facilities where people convicted of crimes serve their sentences. Common names include: prison, penitentiary, correctional institution, federal or state correctional facility, and conservation camp. The prisons are classified by two types of control: (1) “federal” (operated by or for the Bureau of Prisons of the Department of Justice) and (2) “state.” Residents who are forensic patients or criminally insane are classified on the basis of where they resided at the time of enumeration. Patients in hospitals (units, wings, or floors) operated by or for federal or correctional authorities are counted in the prison population. Other forensic patients will be enumerated in psychiatric hospital units and floors for long-term non-acute patients. This category may include privately operated correctional facilities.</p>

104	Local Jails and Other Municipal Confinement Facilities Correctional facilities operated by or for counties, cities, and American Indian and Alaska Native tribal governments. These facilities hold adults detained pending adjudication and/or people committed after adjudication. This category also includes work farms and camps used to hold people awaiting trial or serving time on relatively short sentences. Residents who are forensic patients or criminally insane are classified on the basis of where they resided at the time of enumeration. Patients in hospitals (units, wings, or floors) operated by or for local correctional authorities are counted in the jail population. Other forensic patients will be enumerated in psychiatric hospital units and floors for long-term non-acute patients. This category may include privately operated correctional facilities.
105	Correctional Residential Facilities These are community-based facilities operated for correctional purposes. The facility residents may be allowed extensive contact with the community, such as for employment or attending school, but are obligated to occupy the premises at night. Examples are halfway houses, restitution centers, and prerelease, work release, and study centers.
106	Military Disciplinary Barracks and Jails Correctional facilities managed by the military to hold those awaiting trial or convicted of crimes.
201	Group Homes for Juveniles (non-correctional) Includes community-based group living arrangements for youth in residential settings that are able to accommodate three or more clients of a service provider. The group home provides room and board and services, including behavioral, psychological, or social programs. Generally, clients are not related to the caregiver or to each other. Examples are maternity homes for unwed mothers, orphanages, and homes for abused and neglected children in need of services. Group homes for juveniles do not include residential treatment centers for juveniles or group homes operated by or for correctional authorities.
202	Residential Treatment Centers for Juveniles (non-correctional) Includes facilities that primarily serve youth that provide services on-site in a highly structured live-in environment for the treatment of drug/alcohol abuse, mental illness, and emotional/behavioral disorders. These facilities are staffed 24 hours a day. The focus of a residential treatment center is on the treatment program. Residential treatment centers for juveniles do not include facilities operated by or for correctional authorities.

203	<p>Correctional Facilities Intended for Juveniles</p> <p>Includes specialized facilities that provide strict confinement for its residents and detain juveniles awaiting adjudication, commitment or placement, and/or those being held for diagnosis or classification. Also included are correctional facilities where residents are permitted contact with the community, for purposes such as attending school or holding a job. Examples are residential training schools and farms, reception and diagnostic centers, group homes operated by or for correctional authorities, detention centers, and boot camps for juvenile delinquents.</p>
301	<p>Nursing Facilities/Skilled-Nursing Facilities</p> <p>Includes facilities licensed to provide medical care with seven day, twenty-four hour coverage for people requiring long-term non-acute care. People in these facilities require nursing care, regardless of age. Either of these types of facilities may be referred to as nursing homes.</p>
401	<p>Mental (Psychiatric) Hospitals and Psychiatric Units in Other Hospitals</p> <p>Includes psychiatric hospitals, units and floors for long-term non-acute care patients. The primary function of the hospital, unit, or floor is to provide diagnostic and treatment services for long-term non-acute patients who have psychiatric-related illness. All patients are enumerated in this category.</p>
402	<p>Hospitals with Patients Who Have No Usual Home Elsewhere</p> <p>Includes hospitals if they have any patients who have no exit or disposition plan, or who are known as "boarder patients" or "boarder babies." All hospitals are eligible for inclusion in this category except psychiatric hospitals, units, wings or floors operated by federal, state or local correctional authorities. Patients in hospitals operated by these correctional authorities will be counted in the prison or jail population. Psychiatric units and hospice units in hospitals are also excluded. Only patients with no usual home elsewhere are enumerated in this category.</p>
403	<p>In-Patient Hospice Facilities</p> <p>Includes in-patient hospice facilities (both free-standing and units in hospitals) that provide palliative, comfort, and supportive care for the terminally ill patient and their families. Only patients with no usual home elsewhere are tabulated in this category.</p>
404	<p>Military Treatment Facilities with Assigned Patients</p> <p>These facilities include military hospitals and medical centers with active duty patients assigned to the facility. Only these patients are enumerated in this category.</p>
405	<p>Residential Schools for People with Disabilities</p> <p>Includes schools that provide the teaching of skills for daily living, education programs, and care for students with disabilities in a live-in environment.</p> <p>Examples are residential schools for the physically or developmentally disabled.</p>

501*	College/University Student Housing (College/University owned/leased/managed)
502*	College/University Student Housing (Privately owned/leased/managed) Includes residence halls and dormitories, which house college and university students in a group living arrangement. These facilities are owned, leased, or managed either by a college, university, or seminary, or by a private entity or organization. Fraternity and sorority housing recognized by the college or university are included as college student housing. Students attending the U.S. Naval Academy, the U.S. Military Academy (West Point), the U.S. Coast Guard Academy, and the U.S. Air Force Academy are counted in military group quarters.
601 602	Military Quarters Military Ships These facilities include military personnel living in barracks (including “open” barrack transient quarters) and dormitories and military ships. Patients assigned to Military Treatment Facilities and people being held in military disciplinary barracks and jails are not enumerated in this category. Patients in Military Treatment Facilities with no usual home elsewhere are not enumerated in this category.
701*	Emergency and Transitional Shelters (with Sleeping Facilities) for People Experiencing Homelessness Facilities where people experiencing homelessness stay overnight. These include: <ul style="list-style-type: none"> • Shelters that operate on a first-come, first-serve basis where people must leave in the morning and have no guaranteed bed for the next night. • Shelters where people know that they have a bed for a specified period of time (even if they leave the building every day). • Shelters that provide temporary shelter during extremely cold weather (such as churches). This category does not include shelters that operate only in the event of a natural disaster. Examples are emergency and transitional shelters; missions; hotels and motels used to shelter people experiencing homelessness; shelters for children who are runaways, neglected or experiencing homelessness; and similar places known to have people experiencing homelessness.
703	Domestic Violence Shelters Includes community-based homes, shelters or crisis centers that provide housing for people who have sought shelter from household violence and may have been physically abused.

702	Soup Kitchens
704	Regularly Scheduled Mobile Food Vans
706	Targeted Non-Sheltered Outdoor Locations Includes soup kitchens that offer meals organized as food service lines or bag or box lunches for people experiencing homelessness; street locations where mobile food vans regularly stop to provide food to people experiencing homelessness; and targeted non- sheltered outdoor locations where people experiencing homelessness live without paying to stay. Targeted non-sheltered outdoor locations must have a specific location description; for example, “the Brooklyn Bridge at the corner of Bristol Drive” or “the 700 block of Taylor Street behind the old warehouse.”
801*	Group Homes Intended for Adults Group homes are community-based group living arrangements in residential settings that are able to accommodate three or more clients of a service provider. The group home provides room and board and services, including behavioral, psychological, or social programs. Generally, clients are not related to the caregiver or to each other. Group homes do not include residential treatment centers or facilities operated by or for correctional authorities.
802*	Residential Treatment Centers for Adults Residential facilities that provide treatment on-site in a highly structured live-in environment for the treatment of drug/alcohol abuse, mental illness, and emotional/behavioral disorders. They are staffed 24-hours a day. The focus of a residential treatment center is on the treatment program. Residential treatment centers do not include facilities operated by or for correctional authorities.
900	Maritime/Merchant Vessels Includes U.S. owned and operated flag vessels used for commercial or noncombatant government related purposes at U.S. ports, upon the sea, or on the Great Lakes.
901*	Workers’ Group Living Quarters and Job Corps Centers Includes facilities such as dormitories, bunkhouses, and similar types of group living arrangements for agricultural and non-agricultural workers. This category also includes facilities that provide a full-time, year-round residential program offering a vocational training and employment program that helps young people 16-to-24 years old learn a trade, earn a high school diploma or GED, and get help finding a job. Examples are group living quarters at migratory farm worker camps, construction workers’ camps, Job Corps centers and vocational training facilities.

902*	Religious Group Quarters These are living quarters owned or operated by religious organizations that are intended to house their members in a group living situation. This category includes such places as convents, monasteries, and abbeys. Living quarters for students living or staying in seminaries are classified as college student housing not religious group quarters.
903	Living Quarters for Victims of Natural Disasters These are temporary group living arrangements established as a result of natural disasters.
999	Vacants The facility is not in use.

***Staff residing at this type of Group Quarters are counted in the same GQ as the other residents. These codes are 501, 701, 702, 801, 802, 901, and 902.**